

CR - 134012

VOLUME II

APPENDICES

STATISTICAL EVALUATION OF TIME SERIES

ANALYSIS TECHNIQUES

Final Report

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APPENDIX 1

Listing of Program and Documentation of Use

U S E O F S P E C T

THE FOLLOWING IS A LIST OF INPUT PARAMETERS AND DATA CARDS AND THEIR INTERPRETATIONS.

JDOMAIN-DOMAIN OF ANALYSIS. 0 OR BLANK=PERIOD, 1=FREQUENCY.

JBANDS-HW VECTOR OF FREQUENCY OR PERIOD BANDS WILL BE OBTAINED.

0 OR BLANK=GENERATE ACCORDING TO LIMITS SUBSEQUENTLY READ IN.

1=READ IN A VECTOR OF BANDS TO BE USED FROM CARDS.

NBANDS-HW MANY FREQUENCY OR PERIOD BANDS WILL BE USED.

NQBS-THE NUMBER OF OBSERVATIONS IN THE DATA VECTOR

JANALY-HW THE DATA SHALL BE ANALYZED.

0 OR BLANK=DO UNIVARIATE SPECTRUM, SEARCH FOR BEST K-VARIATE

MODEL

1=SIMPLY DO UNIVARIATE SPECTRUM

2=DO K-VARIATE SPECTRUM ACCORDING TO MODEL PARAMETER READ IN

JDATA-TELLS SUBROUTINE DEPVAR WHERE TO GET DATA.

0 OR BLANK=READ FROM CARDS ACCORDING TO FORMAT (10X,7F10.0)

1=GENERATE DATA FROM MODELING PROGRAM CALLED BY DATA. THIS

MODELING PROGRAM WILL ASK FOR MORE CARDS.

JCRITER-SELECTS CRITERION FOR OPTIMIZATION OF K-VARIATE SPECTRUM.

0 OR BLANK=MULTIPLE R-SQUARED

1=T-VALUES

JPRINT-PRINTOUT CONTROL DIGIT

0=DONT PRINT ANY RESULTS

1=PRINT ONLY FINAL RESULTS

2=PRINT FINAL AND INTERMEDIATE RESULTS

3=PRINT AS FOR 2 PLUS MATRICES, CORRELATIONS, ETC FOR EACH STEP

JPLOT-PLT CONTROL DIGIT. - VALUES AS ABOVE EXCEPT FOR 3.

BANDLO-LOWEST FREQ. OR LONGEST PERIOD, AS APPROPRIATE TO DOMAIN.

BANDHI-HIGHEST FREQ. OR SHORTEST PERIOD, AS APPROPRIATE TO DOMAIN.

BANDS-VECTOR OF BANDS.

NSIN-NUMBER OF SINE WAVES IN SIMULATED DATA.

BAND-FREQ. OR PERIOD OF THE LSINTH SIMULATED SINE WAVE

SD-STANDARD DEVIATION OF THE LSINTH SIMULATED SINE WAVE. (AMPLITUDE)

SDN-STANDARD DEV. OF GAUSSIAN NOISE

THE FOLLOWING IS A LIST OF INPUT CARDS AND THEIR CONTENTS

CARD 1 - - - MANDATORY

COLUMN	VARIABLE	COMMENTS - - -
1 - 5	JDDMAN	RIGHT JUSTIFY
6 - 10	JBANDS	RIGHT JUSTIFY
11 - 15	NBANDS	RIGHT JUSTIFY
16 - 20	NDRS	RIGHT JUSTIFY
21 - 25	JANALY	RIGHT JUSTIFY
26 - 30	JDATA	RIGHT JUSTIFY
31 - 35	JCRITR	RIGHT JUSTIFY
36 - 40	JPRINT	RIGHT JUSTIFY
41 - 45	JPLOT	

CARD 2 - - - REQUIRED ONLY IF JBANDS=0, OTHERWISE OMIT.

COLUMN	VARIABLE	COMMENTS - - -
1 - 10	BANDLO	PUNCH DECIMAL
11 - 20	BANDEL	PUNCH DECIMAL

CARDS 3 - - - REQUIRED ONLY IF JBANDS=1.

COLUMN	VARIABLE	COMMENTS - - -
1 - 10	BANDS(1)	PUNCH DECIMAL - 1ST BAND IN SPECTRUM.
11 - 20	BANDS(2)	PUNCH DECIMAL - 2ND BAND IN SPECTRUM.

*

CONTINUE FOR AS MANY CARDS AS NEEDED TO READ IN NBANDS BANDS.
FORMAT(3F10.0)

CARDS 4 - - - REQUIRED ONLY IF JDATA=0.

COLUMN	VARIABLE	COMMENTS - - -
1 - 10	ID CODE	MAY CONTAIN ANYTHING - NOT READ.
11 - 20	DATA(1)	1ST DATA POINT. PUNCH DECIMAL OR RIGHT JUSTIFY.
21 - 30	DATA(2)	2ND DATA POINT. PUNCH DECIMAL OR RIGHT JUSTIFY.

*

CONTINUE SAME FORMAT ON CARDS AS NEEDED FOR NOBS DATA POINTS.
FORMAT(10X,7F10.0)

CARDS 5 - - - REQUIRED ONLY IF JDATA=1.

5A - - MANDATORY.

COLUMN	VARIABLE	COMMENTS - - -
1 - 5	NSIN	RIGHT JUSTIFY.

5B - - REQUIRED ONLY IF NSIN IS NOT ZERO.

COLUMN	VARIABLE	COMMENTS - - -
1 - 10	BAND(1)	PUNCH DECIMAL.
11 - 20	SD(1)	PUNCH DECIMAL.

CONTINUE SAME FORMAT THRU NSIN CAPDS (BANDS). FORMAT(2F10.0)

5C - - MANDATORY

COLUMN	VARIABLE	COMMENTS - - -
1 - 10	SDN	PUNCH DECIMAL

5D - - REQUIRED ONLY IF SDN IS NOT ZERO

COLUMN	VARIABLE	COMMENTS - - -
1 - 4	ID CODE	MAY CONTAIN ANYTHING - NOT READ.
5 - 10	NOISE(1)	PUNCH DECIMAL. 1ST GAUSSIAN RANDOM NUMBER.
11 - 16	NOISE(2)	PUNCH DECIMAL. 2ND GAUSSIAN RANDOM NUMBER.

*

CONTINUE THRU AS MANY CARDS AS NEEDED FOR NOBS RANDOM NUMBERS.
FORMAT(4X,10F6.4)

C		SPT	10
C		SPT	20
C	*****	SPT	30
C	*****	SPT	40
C		SPT	50
C		SPT	60
	DIMENSION BANDS(50),BAN(50),PEAKS(50),PHASE(50),AMNAME(9),TNAME	SPT	70
	1(9),PNAME(9),BANAME(5),XNAME(5),LVAR(100),ISAVE(100)	SPT	80
C		SPT	90
C	C-THE FOLLOWING DIMENSION MUST BE EQUAL TO OR GREATER THAN	SPT	100
C	C- NOBS*(NBANDS*2+1)	SPT	110
C		SPT	120
	DIMENSION X(30000)	SPT	130
C		SPT	140
C	C-THE FOLLOWING DIMENSIONS MUST BE EQUAL TO OR GREATER THAN NBANDS*2+1	SPT	150
C		SPT	160
	DIMENSION XBAR(100),STD(100),B(100),D(100),T(100)	SPT	170
C		SPT	180
C	C-THE FOLLOWING DIMENSION MUST BE EQUAL TO OR GREATER THAN	SPT	190
C	C- M*M, WHERE M=2*NBANDS+1	SPT	200
C		SPT	210
	DIMENSION RX(10000)	SPT	220
C		SPT	230
C	C-THE FOLLOWING DIMENSION MUST BE EQUAL TO OR GREATER THAN (M+1)*M/2	SPT	240
C		SPT	250
	DIMENSION R(5050)	SPT	260
	COMMON KREADR,KPRINT	SPT	270
	DATA AMNAME/'AMPL','ITUD','E ES','IMAT','E. ',' ',' ',' '	SPT	280
	1',' '	SPT	290
	DATA TNAME/'T-VA','LUE.',' ',' ',' ',' ',' '	SPT	300
	1',' '	SPT	310
	DATA PHNAME/'PHAS','E ES','TIMA','TE. ',' ',' ',' '	SPT	320
	1',' '	SPT	330
	DATA BANAME/'FREQ','UENC','Y ',' ',' '	SPT	340
	DATA XNAME/'PERI','OD ',' ',' '	SPT	350
	KREADR=5	SPT	360
	KPRINT=6	SPT	370
C		SPT	380
C	C-READ IN CONTROL DIGITS AS FOLLOWS AND PRINT THEM OUT.	SPT	390
C	C JDOMAN-DOMAIN OF ANALYSIS. 0 OR BLANK=PERIOD, 1=FREQUENCY.	SPT	400
C	C JNBANDS-HOW VECTOR OF FREQUENCY OR PERIOD BANDS WILL BE OBTAINED.	SPT	410
C	C 0 OR BLANK=GENERATE ACCORDING TO LIMITS SUBSEQUENTLY READ IN.	SPT	420
C	C 1=READ IN A VECTOR OF BANDS TO BE USED FROM CARDS.	SPT	430
C	C NBANDS-HOW MANY FREQUENCY OR PERIOD BANDS WILL BE USED.	SPT	440
C	C NOBS-THE NUMBER OF OBSERVATIONS IN THE DATA VECTOR	SPT	450
C	C JANALY-HOW THE DATA SHALL BE ANALYZED.	SPT	460
C	C 0 OR BLANK=DO UNIVARIATE SPECTRUM, SEARCH FOR BEST K-VARIATE	SPT	470
C	C MODEL	SPT	480
C	C 1=SIMPLY DO UNIVARIATE SPECTRUM	SPT	490
C	C 2=DO K-VARIATE SPECTRUM ACCORDING TO MODEL PARAMETER READ IN	SPT	500
C	C JDATA-TELLS SUBROUTINE DEPVAR WHERE TO GET DATA.	SPT	510
C	C 0 OR BLANK=READ FROM CARDS ACCORDING TO FORMAT (10X,7F10.0)	SPT	520
C	C 1=GENERATE DATA FROM MODELING PROGRAM CALLED BY DATA. THIS	SPT	530
C	C MODELING PROGRAM WILL ASK FOR MORE CARDS.	SPT	540

C	JCRITR-SELECTS CRITERION FOR OPTIMIZATION OF K-VARIATE SPECTRUM.	SPT	550
C	0 OR BLANK=MULTIPLE R-SQUARED	SPT	560
C	1=T-VALUES	SPT	570
C	JPRINT-PRINTOUT CONTROL DIGIT	SPT	580
C	0=DONT PRINT ANY RESULTS	SPT	590
C	1=PRINT ONLY FINAL RESULTS	SPT	600
C	2=PRINT FINAL AND INTERMEDIATE RESULTS	SPT	610
C	3=PRINT AS FOR 2 PLUS MATRICES, CORRELATIONS, ETC FOR EACH STEP	SPT	620
C	JPLOT-PLOT CONTROL DIGIT. - VALUES AS ABOVE EXCEPT FOR 3.	SPT	630
C	READ (KREADR,1) JDOMAN,JBANDS,NBANDS,NOBS,JANALY,JDATA,JCRITR,	SPT	650
	1 JPRINT,JPLOT	SPT	660
	1 FORMAT (16I5)	SPT	670
	WRITE (KPRINT,103)	SPT	680
	103 FORMAT ('1 * * * * * PROGRAM PARAMETERS * * * * *')	SPT	690
	WRITE (KPRINT,1)JDOMAN,JBANDS,NBANDS,NOBS,JANALY,JDATA,JCRITR,	SPT	700
	1 JPRINT,JPLOT	SPT	710
C		SPT	720
C	KTOP =MAX NUMBER OF TIMES THE PROGRAM WILL BE ALLOWED TO TRY IMPROVE-	SPT	730
C	MENTS ON THE WHOLE MULTIVARIATE SPECTRUM. KOUNT IS THE NUMBER OF	SPT	740
C	C-SUCH TRIES.	SPT	750
C		SPT	760
	KTOP=4	SPT	770
	KOUNT=0	SPT	780
C		SPT	790
C	SET SIGLEV, THE T-VALUE FOR THE CRITERION OF ACCEPTANCE OF A PEAK.	SPT	800
C	THEN DECIDE HOW TO GET VECTOR OF BANDS.	SPT	810
C		SPT	820
	SIGLEV=2.0	SPT	830
	IF (JBANDS) 100,100,110	SPT	840
C		SPT	850
C	READ IN LIMITS OF BANDS VECTOR IF JBANDS WAS 0 - GENERATE BANDS.	SPT	860
C	OTHERWISE GO TO 110 AND READ IN BANDS FROM CARDS.	SPT	870
C	BANDLO-LOWEST FREQ. OR LONGEST PERIOD, AS APPROPRIATE TO DOMAIN.	SPT	880
C	BANDEL-DELTA(FREQ.) OR DELTA(PERIOD), AS APPROPRIATE TO DOMAIN.	SPT	890
C	BANDS-VECTOR OF BANDS.	SPT	900
C		SPT	910
	100 READ (KREADR,2) BANDLO,BANDEL	SPT	920
	2 FORMAT (8F10.0)	SPT	930
	BANDS(1)=BANDLO	SPT	940
	DO 120 LBAND=2,NBANDS	SPT	950
	120 BANDS(LBAND)=BANDS(LBAND-1) + BANDEL	SPT	960
	GO TO 130	SPT	970
	110 READ (KREADR,2) (BANDS(LBAND),LBAND=1,NBANDS)	SPT	980
C		SPT	990
C	CONVERT BANDS TO PERIOD DOMAIN IF ORIGINATED IN FREQ DOMAIN.	SPT	1000
C	REVERSE THE ORDER OF BANDS SO AS TO BE IN ASCENDING WAVELENGTH ORDER.	SPT	1010
C	ALSO GENERATE BAN, THE FREQ DOMAIN VECTOR OF BANDS.	SPT	1020
C		SPT	1030
	130 IF (JDOMAN) 150,150,140	SPT	1040
	140 DO 141 LBAND=1,NBANDS	SPT	1050
	BAN(LBAND)=BANDS(LBAND)	SPT	1060
	141 BANDS(LBAND)=1.0/BANDS(LBAND)	SPT	1070
	CALL REV(BANDS,NBANDS)	SPT	1080
		SPT	1090
C		SPT	1100
C	GENERATE SIN/COS PREDICTOR MATRIX AS PART OF DATA MATRIX, X. THEN	SPT	1100

C-READ IN DEPENDENT VARIABLE PART OF X. THESE DATA WILL THEN BE ENT-	SPT 1110
C-ERED INTO SUBROUTINE CORRE TO COMPUTE THE CORRELATION MATRIX OF ALL	SPT 1120
C-VARIABLES.	SPT 1130
C	SPT 1140
150 M=NBANDS*2 + 1	SPT 1150
CALL PREGEN(X,BANDS,NOBS,NBANDS)	SPT 1160
CALL DEPVAR(X,NOBS,JDATA,JDOMAN,JPRINT)	SPT 1170
C	SPT 1180
C-GENERATE VECTOR OF VARIABLE NUMBERS FOR LATER USE.	SPT 1190
C	SPT 1200
DO 155 LV=1,M	SPT 1210
155 LVAR(LV)=LV	SPT 1220
CALL CORRE(NOBS,M,L,X,XBAR,STD,RX,R,B,D,T)	SPT 1230
C	SPT 1240
C-SET TOPP. THE MAXIMUM ALLOWABLE TOTAL AMPLITUDE IN THE FINAL SPECTRUM	SPT 1250
C-TOPP IS THE TOTAL AMPLITUDE OF THE F(T)+25 PERCENT.	SPT 1260
C	SPT 1270
TOPP=STD(1)+.25*STD(1)	SPT 1280
C	SPT 1290
C-PRINT OUT MATRICES ETC., IF DESIRED	SPT 1300
C	SPT 1310
IF(JPRINT-3) 151,152,152	SPT 1320
152 WRITE (KPRINT,5)	SPT 1330
5 FORMAT('IN A T R I X O F C O R R E L A T I O N S',/, ' V A R I A B S	SPT 1340
1LE 1 IS THE DEPENDENT VARIABLE, ALL OTHERS ARE COSINE AND SINE WAV	SPT 1350
ZES OF VARIOUS PERIODS ',/,T88,'-----',/, '0')	SPT 1360
CALL MATPRT(R,M,LVAR)	SPT 1370
C	SPT 1380
C-DECIDE ON PROPER DATA ANALYSIS PATH.	SPT 1390
C	SPT 1400
151 JANALY=JANALY+1	SPT 1410
GO TO (200,400,600),JANALY	SPT 1420
C	SPT 1430
C	SPT 1440
C*****	SPT 1450
C*****	SPT 1460
C	SPT 1470
C	SPT 1480
C-STATEMENTS 200-400 INVOLVE COMPUTATION OF OPTIMIZED K-BANDS SPECTRA	SPT 1490
C	SPT 1500
C-FIRST COMPUTE UNIVARIATE SPECTRUM USING SUBROUTINE USPECT. THEN FIND	SPT 1510
C-ALL SIGNIFICANT SPECTRUM PEAKS IN UNIVARIATE SPECTRUM.	SPT 1520
C	SPT 1530
200 CALL USPECT(R,T,NOBS,M,B,NBANDS,STD,JPRINT,JPLOT,PHASE,BAN,BANDS	SPT 1540
1,AMNAME,TNAME,PHNAME,XNAME,JDOMAN,BANAME)	SPT 1550
CALL PPIKR(R,T,ISAVE,NPEAK,NBANDS,SIGLEV)	SPT 1560
IF (NPEAK) 201,201,202	SPT 1570
201 WRITE (KPRINT,66)	SPT 1580
66 FORMAT('0** * * * NO SIGNIFICANT PEAKS FOUND * * * **')	SPT 1590
GO TO 2000	SPT 1600
C	SPT 1610
C-NOW LOOP THRU AN OPTIMIZING PROCESS TRYING TO FIND LARGEST VALUE OF	SPT 1620
C-EITHER T OR R-SQUARE. THE BEGINNING OF THIS LOOP IS STATEMENT 210	SPT 1630
C	SPT 1640
C-SET A VALJE OF CRIT=0. THIS WILL LATER BE USED TO STORE THE JUST	SPT 1650
C-PRECEDING VALUE OF THE OPTIMIZATION CRITERION. ALSO INITIALIZE THE	SPT 1660

C-VARIABLE MM =-1. MM IS THE DIRECTION OF PEAK SLIDING AS WELL AS THE	SPT 1670
C-COUNTER FOR THE NUMBER OF STEPS.	SPT 1680
C	SPT 1690
202 LPEAK=1	SPT 1700
CRIT=0.0	SPT 1710
MM=0	SPT 1720
210 CALL KSPECT(R,T,NBRS,M,NPEAK,ISAVE,RX,B,JPRINT,XBAR,STD,D,RSQ,	SPT 1730
IPHASE,BANDS,BANI)	SPT 1740
C	SPT 1750
C-TEST FOR PRINTOUT	SPT 1760
C	SPT 1770
IF(JPRINT-3)208,209,209	SPT 1780
209 WRITE (KPRINT,6) RSQ	SPT 1790
6 FORMAT ('MULTIPLE SQUARED CORRELATION=',F8.4)	SPT 1800
WRITE (KPRINT,7)	SPT 1810
7 FORMAT (' PERIOD/FREQ.',T20,'AMPLITUDE',T40,'T-VALUE')	SPT 1820
DO 214 LO=1,NPEAK	SPT 1830
KK=ISAVE(LO)	SPT 1840
IF (JDOAN) 212,212,213	SPT 1850
212 BB=BANDS(KK)	SPT 1860
GO TO 214	SPT 1870
213 BB=BAN(KK)	SPT 1880
214 WRITE (KPRINT,8) BB,B(KK),T(KK)	SPT 1890
8 FORMAT (2F12.4,F18.4)	SPT 1900
C	SPT 1910
C-SELECT CRITERION FOR GOODNESS OF FIT - CHECK FOR IMPROVEMENT	SPT 1920
C	SPT 1930
208 IF (CRITR(RSQ,T,JCRITR,LPEAK)-CRIT) 220,220,230	SPT 1940
C	SPT 1950
C-A BRANCH TO 220 IMPLIES NON-IMPROVEMENT. EITHER RESORE OLD VALUE AND	SPT 1960
C-GO TO NEXT PEAK (221 OR 223), OR TRY MOVING UP (222).	SPT 1970
C	SPT 1980
220 IF (MM+1) 221,222,223	SPT 1990
C	SPT 2000
C-A BRANCH TO 221 IMPLIES THAT WE HAVE BEEN MOVING DOWN FOR 2 OR MORE	SPT 2010
C-STEPS. THIS IS THE FIRST NON-IMPROVEMENT. RESTORE JUST FORMER VALUE	SPT 2020
C-AND GO TO NEXT PEAK.	SPT 2030
C	SPT 2040
221 ISAVE(LPEAK)=ISAVE(LPEAK)+1	SPT 2050
MM=-1	SPT 2060
LPEAK=LPEAK+1	SPT 2070
ISAVE(LPEAK)=ISAVE(LPEAK)-1	SPT 2080
GO TO 300	SPT 2090
C	SPT 2100
C-A BRANCH TO 222 IMPLIES FIRST MOVE DOWN AND NON-IMPROVEMENT. TRY	SPT 2110
C-MOVING SAME PEAK UP	SPT 2120
C	SPT 2130
222 MM=1	SPT 2140
ISAVE(LPEAK)=ISAVE(LPEAK)+2	SPT 2150
IF (ISAVE(LPEAK)-NBANDS) 300,225,225	SPT 2160
225 WRITE (KPRINT,3)	SPT 2170
3 FORMAT ('***** WARNING * - JUST TRIED TO MOVE A PEAK INSPT	SPT 2180
1TO THE LONGEST PERIOD (LOWEST FREQUENCY) BAND. TRY WIDER SPECTRUMS	SPT 2190
2 LIMITS.')	SPT 2200
GO TO 2000	SPT 2210
C	SPT 2220

C-A BRANCH TO 223 IMPLIES THAT WE HAVE BEEN MOVING UP AND IT DIDNT HELP.	SPT 2230
C-RESTORE JUST PRIOR VALUE AND GO TO NEXT PEAK.	SPT 2240
C	SPT 2250
223 ISAVE(LPEAK)=ISAVE(LPEAK)-1	SPT 2260
MM=-1	SPT 2270
LPEAK=LPEAK+1	SPT 2280
ISAVE(LPEAK)=ISAVE(LPEAK)-1	SPT 2290
GO TO 300	SPT 2300
C	SPT 2310
C	SPT 2320
C-A BRANCH TO 230 IMPLIES IMPROVEMENT. CONTINUE IN SAME DIRECTION.	SPT 2330
C	SPT 2340
230 IF (MM) 231,231,232	SPT 2350
C	SPT 2360
C-A BRANCH TO 231 IMPLIES WE WERE MOVING DOWN. - CONTINUE SAME DIRECTION	SPT 2370
C	SPT 2380
231 MM=MM-1	SPT 2390
CRIT=CRITR(RSQ,T,JCRITR,LPEAK)	SPT 2400
ISAVE(LPEAK) =ISAVE(LPEAK)-1	SPT 2410
IF (ISAVE(LPEAK)-1) 234,234,300	SPT 2420
234 WRITE (KPRINT,4)	SPT 2430
4 FORMAT('0** * * * W A R N I N G * - JUST TRIED TO MOVE A PEAK INT	SPT 2440
10 THE SHORTEST PERIOD (HIGHEST FREQUENCY) BAND. TRY WIDER SPECTRUS	SPT 2450
2M LIMITS')	SPT 2460
GO TO 2000	SPT 2470
C	SPT 2480
C-A BRANCH TO 232 IMPLIES WE WERE MOVING UP. - CONTINUE SAME DIRECTION.	SPT 2490
C	SPT 2500
232 MM=MM+1	SPT 2510
CRIT=CRITR(RSQ,T,JCRITR,LPEAK)	SPT 2520
ISAVE(LPEAK)=ISAVE(LPEAK)+1	SPT 2530
IF ((ISAVE(LPEAK)-NBANDS) 300,225,225	SPT 2540
C	SPT 2550
C	SPT 2560
C-STATEMENT 300 CHECKS TO SEE THAT WE ARE NOT OFF THE END OF THE ISAVE	SPT 2570
C-VECTOR. IF NOT, DO ANOTHER K-BANDS SPECTRUM WITH NEW ISAVE VECTOR	SPT 2580
C-VALUES. IF WE ARE OFF THE END, COMPUTE A NEW FULL SPECTRUM USING A	SPT 2590
C-K-VARIATE MODEL. ALSO CHECK FOR VALUES OF ISAVE EQUAL TO EACH OTHER.	SPT 2600
C-IF WE HAVE JUST MOVED INTO A ANOTHER PEAK, REDUCE NPEAK BY ONE AND	SPT 2610
C-PACK THE VECTOR DOWN AND START PROCESS OVER AT LPEAK=1.	SPT 2620
C	SPT 2630
300 IF (LPEAK-NPEAK) 320,320,310	SPT 2640
320 IF (LPEAK-1) 322,322,321	SPT 2650
321 IF (ISAVE(LPEAK)-ISAVE(LPEAK-1)) 322,323,322	SPT 2660
322 IF (LPEAK-NPEAK) 324,210,324	SPT 2670
324 IF (ISAVE(LPEAK)-ISAVE(LPEAK+1)) 210,325,210	SPT 2680
323 DO 330 LL=LPEAK,NPEAK	SPT 2690
330 ISAVE(LL-1)=ISAVE(LL)	SPT 2700
NPEAK=NPEAK-1	SPT 2710
LPEAK=1	SPT 2720
MM=0	SPT 2730
CRIT=0.0	SPT 2740
GO TO 210	SPT 2750
325 NPEAK=NPEAK-1	SPT 2760
DO 331 LL=LPEAK,NPEAK	SPT 2770
331 ISAVE(LL)=ISAVE(LL+1)	SPT 2780

LPEAK=1	SPT 2790
MM=0	SPT 2800
CRIT=0.0	SPT 2810
GO TO 210	SPT 2820
C	SPT 2830
C-A BRANCH TO 310 OCCURS WHEN OPTIMIZATION OF THE K-BANDS MODEL IS	SPT 2840
C-COMPLETE. NOW COMPUTE A FULL SPECTRUM USING THE OPTIMIZED K-BANDS	SPT 2850
C-MODEL. SEARCH NEW K-B SPECTRUM FOR PEAKS AND SEE IF ANY NEW ONES TUR-	SPT 2860
C-NED UP. IF SO, GO THRU WHOLE OPTIMIZATION ROUTINE AGAIN.	SPT 2870
C	SPT 2880
310 IF (JPRINT-3)360,361,361	SPT 2890
361 WRITE (KPRINT,9)	SPT 2900
9 FORMAT('COMPUTING SPECTRUM USING THE FOLLOWING BANDS IN MODEL')	SPT 2910
IF (JDOMAN)362,362,363	SPT 2920
362 DO 364 LO=1,NPEAK	SPT 2930
KK=ISAVE(LO)	SPT 2940
364 WRITE (KPRINT,8) BANDS(KK)	SPT 2950
GO TO 360	SPT 2960
363 DO 366 LO=1,NPEAK	SPT 2970
KK=ISAVE(LO)	SPT 2980
366 WRITE (KPRINT,8) BAN(KK)	SPT 2990
360 CALL MULTI(ISAVE,NPEAK,NBANDS,R,T,NOBS,M,RX,B,XBAR,STD,D,RSQ,	SPT 3000
1 PHASE,BANDS,BAN)	SPT 3010
KOUNT=KOUNT+1	SPT 3020
IF (KOUNT-KTOP) 384,384,385	SPT 3030
385 WRITE (KPRINT,386)	SPT 3040
386 FORMAT('THE PROGRAM IS PROBABLY CAUGHT IN A LOOP. TRY DIFFERENT	SPT 3050
1 INPUT PARAMETERS AND SUBMIT AGAIN')	SPT 3060
GO TO 2000	SPT 3070
384 CALL PPIKR(B,T,ISAVE,NPEEK,NBANDS,SIGLEV)	SPT 3080
IF (NPEAK-NPEEK) 311,350,311	SPT 3090
311 NPEAK=NPEEK	SPT 3100
LPEAK=1	SPT 3110
MM=0	SPT 3120
CRIT=0.0	SPT 3130
GO TO 210	SPT 3140
C	SPT 3150
C-A STABLE STATE IN THE OPTIMIZING ROUTINE RESULTS IN A BRANCH TO 350.	SPT 3160
C-OUTPUT RESULTS.-	SPT 3170
C	SPT 3180
350 WRITE (KPRINT,67)	SPT 3190
67 FORMAT('MULTIPLE BAND SPECTRUM')	SPT 3200
CALL OUTPUT(BANDS,BAN,B,T,PHASE,NBANDS,AMNAME,TNAME,PHNAME,	SPT 3210
1BANAME,XNAME,JPRINT,JPLOT,JDOMAN)	SPT 3220
WRITE (KPRINT,6) RSQ	SPT 3230
C	SPT 3240
C-CHECK FINAL SPECTRUM FOR EXCESSIVE TOTAL POWER IN SIGNIFICANT BANDS.	SPT 3250
C	SPT 3260
CALL TOTAMIX,NOBS,NPEAK,ISAVE,M,PHASE,B,SUMB)	SPT 3270
IF(SUMB-TOPPI) 381,382,382	SPT 3280
382 WRITE (KPRINT,383)	SPT 3290
383 FORMAT('PROGRAM FAILED BY FINDING TOO MUCH POWER IN THE SPECTRUM.	SPT 3300
1',/, ' SUGGEST ALTERING PARAMETERS OF THE ANALYSIS, SUCH AS',/,	SPT 3310
2' USE WIDER SPECTRUM LIMITS, FILTER DATA, ALTER DELTAP, ETC.')	SPT 3320
381 GO TO 2000	SPT 3330
C	SPT 3340

C	SPT 3350
C*****	SPT 3360
C*****	SPT 3370
C	SPT 3380
C	SPT 3390
C-STATEMENTS 400-600 INVOLVE COMPUTATION OF THE SIMPLE, SINGLE BAND	SPT 3400
C-SPECTRUM ONLY.	SPT 3410
C	SPT 3420
400 CALL USPECT(R,T,NOBS,M,B,NBANDS,STD,JPRINT,JPLOT,PHASE,BAN,BANDS,	SPT 3430
1 AMNAME,TNAME,PHNAME,XNAME,JDOAN,BANAME)	SPT 3440
GO TO 2000	SPT 3450
C	SPT 3460
C	SPT 3470
C*****	SPT 3480
C*****	SPT 3490
C	SPT 3500
C	SPT 3510
C-STATEMENTS 600-800 INVOLVE COMPUTATION OF A SPECIFIC K-BAND MODEL	SPT 3520
C-WITHOUT OPTIMIZATION.	SPT 3530
C	SPT 3540
C-FIRST READ IN MODEL PARAMETERS, BUILD VECTOR OF BANDS IN MODEL, THEN	SPT 3550
C-COMPUTE SPECTRUM.	SPT 3560
C	SPT 3570
600 READ (KREADR,1) NPEAK	SPT 3580
READ (KREADR,2) (PEAKS(LPEAK),LPEAK=1,NPEAK)	SPT 3590
DO 610 LPEAK=1,NPEAK	SPT 3600
DO 620 LBAND=1,NBAND	SPT 3610
IF (PEAKS(LPEAK)-BANDS(LBAND)) 620,630,620	SPT 3620
630 ISAVE(LPEAK)=LBAND	SPT 3630
GO TO 610	SPT 3640
620 CONTINUE	SPT 3650
610 CONTINUE	SPT 3660
CALL MULTI(ISAVE,NPEAK,NBANDS,R,T,NOBS,M,RX,B,XBAR,STD,D,RSQ,	SPT 3670
1 PHASE,BANDS,BAN)	SPT 3680
WRITE (KPRINT,5)	SPT 3690
CALL OUTPUT(BANDS,BAN,B,T,PHASE,NBANDS,ANAME,TNAME,PHNAME,	SPT 3700
1 BANAME,XNAME,JPRINT,JPLOT,JDOAN)	SPT 3710
WRITE (KPRINT,6) RSQ	SPT 3720
2000 STOP	SPT 3730
END	SPT 3740

C		REV	10
C		REV	20
	SUBROUTINE REV(X,N)	REV	30
	DIMENSION X(50)	REV	40
C		REV	50
C	*****	REV	60
C *		* REV	70
C *	SUBROUTINE R E V	* REV	80
C *		* REV	90
C *	REV TAKES A VECTOR AND REVERSES ITS ORDER.	* REV	100
C *		* REV	110
C	*****	REV	120
C		REV	130
	J=N+1	REV	140
	MID=N/2	REV	150
	DO 10 L=L,MID	REV	160
	J=J-1	REV	170
	SAVE=X(L)	REV	180
	X(L)=X(J)	REV	190
10	X(J)=SAVE	REV	200
	RETURN	REV	210
	END	REV	220

C		PRED 10
C		PRED 20
	SUBROUTINE PREGEN(X,BANDS,NOBS,NBANDS)	PRED 30
	DIMENSION X(1),BANDS(1)	PRED 40
C		PRED 50
C	*****	PRED 60
C	*	* PRED 70
C	* SUBROUTINE P R E G E N	PRED 80
C	*	* PRED 90
C	* PREGEN GENERATES THE SINE AND COSINE PREDICTOR WAVES AND STORES	* PRED 100
C	* THEM IN MATRIX X. MATRIX X IS THE DATA MATRIX HAVING NOBS ROWS	* PRED 110
C	* AND M COLUMNS. HERE NOBS= THE NUMBER OF OBSERVATIONS AND	* PRED 120
C	* BANDS IS A VECTOR OF PERIOD VALUES IN THE SPECTRUM.	* PRED 130
C	*	* PRED 140
C	* MATRIX X IS STORED IN VECTOR MODE. SEE IBM SYSTEM/360 SUB-	* PRED 150
C	* ROUTINE PACKAGE (360A-CM-03X) VERSION III, PROGRAMMER'S MANUAL,	* PRED 160
C	* PUBLICATION NUMBER H20-0205-3, PAGES 3-6. ESSENTIALLY EACH COL-	* PRED 170
C	* UMN OF MATRIX X IS STRUNG END-TO-END INTO ONE LONG VECTOR.	* PRED 180
C	*	* PRED 190
C	* THE FIRST NOBS VALUES OF VECTOR (MATRIX) X WILL BE THE DEPENDENT	* PRED 200
C	* VARIABLE (SEE SUBROUTINE DEPVAR). THE NEXT NOBS POINTS (COLUMN	* PRED 210
C	* TWO) WILL CONTAIN COS WAVE, BAND 1, THE NEXT NOBS POINTS (COLUMN	* PRED 220
C	* THREE CONTAINS SIN WAVE, BAND 1, ETC.	* PRED 230
C	*	* PRED 240
C	*****	* PRED 250
C		PRED 260
C	C-CONVERT TO RADIANS/OBSERVATION AND LOOP THRU NBANDS TIMES.	PRED 270
C		PRED 280
	L=NOBS	PRED 290
	DO 10 LBAND=1,NBANDS	PRED 300
	AFREQ=6.28318/BANDS(LBAND)	PRED 310
	EF=-AFREQ	PRED 320
	DO 20 LOBS=1,NOBS	PRED 330
	L=L+1	PRED 340
	EF=EF+AFREQ	PRED 350
	20 X(L)=COS(EF)	PRED 360
	EF=-AFREQ	PRED 370
	DO 10 LOBS=1,NOBS	PRED 380
	L=L+1	PRED 390
	EF=EF+AFREQ	PRED 400
	10 X(L)=SIN(EF)	PRED 410
C		PRED 420
	C-X CONTAINS THE VECTORS OF SIN/COS WAVES STRUNG END-TO-END. THIS IS	PRED 430
	C-EQUIVALENT TO A MATRIX WHERE EACH SIN OR COS WAVE FORMS A COLUMN OF	PRED 440
	C-NOBS LENGTH.	PRED 450
C		PRED 460
	RETURN	PRED 470
	END	PRED 480

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C		DEPV	10
C		DEPV	20
	SUBROUTINE DEPVAR(X,NOBS,JDATA,JDOMAN,JPRINT)	DEPV	30
	DIMENSION X(1)	DEPV	40
	COMMON KREADR	DEPV	50
C		DEPV	60
C	*****	DEPV	70
C	*	DEPV	80
C	* SUBROUTINE D E P V A R	DEPV	90
C	*	DEPV	100
C	* DEPVAR EITHER READS IN OR GENERATES (VIA SIMULA), A DEPENDENT	DEPV	110
C	* VARIABLE VECTOR OF LENGTH NOBS. THE DEPENDENT VARIABLE IS STORED*	DEPV	120
C	* INTO THE FIRST NOBS CELLS OF X, A MATRIX OF VARIABLES STORED AS A*	DEPV	130
C	* VECTOR OF COLUMNS. SEE SUBROUTINE PREGEN FOR REST OF X.	DEPV	140
C	*	DEPV	150
C	*****	DEPV	160
C		DEPV	170
	C-IF JDATA IS 0 - READ FROM CARDS. (10X,7F10.0)	DEPV	180
	C-IF JDATA IS 1 - CALL SIMULA WHICH GENERATES DATA USING A MONTE CARLO	DEPV	190
	C-SYSTEM ALONG WITH DETERMINISTIC DATA. SIMULA READS CARDS.	DEPV	200
C		DEPV	210
	IF (JDATA) 10,10,50	DEPV	220
	10 READ (KREADR,1) (X(L),L=1,NOBS)	DEPV	230
	1 FORMAT (10X,7F10.0)	DEPV	240
	GO TO 20	DEPV	250
	50 CALL SIMULA(X,NOBS,JDATA,JDOMAN,JPRINT)	DEPV	260
	20 RETURN	DEPV	270
	END	DEPV	280

C		SIML 10
C		SIML 20
	SUBROUTINE SIMULA(X,N,J,JDOMAN,JPRINT)	SIML 30
	DIMENSION X(1),A(130),BAND(1)	SIML 40
	COMMON KREADR,KPRINT	SIML 50
C		SIML 60
C	*****	SIML 70
C *		* SIML 80
C *	SUBROUTINE S I M U L A	* SIML 90
C *		* SIML 100
C *	SIMULA IS A PRIMITIVE MONTE CARLO AND SIGNAL GENERATOR FOR CREAT--	* SIML 110
C *	ING ARTIFICIAL DATA. GAUSSIAN DATA ARE READ IN FROM CARDS AND	* SIML 120
C *	A NUMBER OF SINE WAVES OF VARIABLE FREQUENCY AND AMPLITUDE ARE	* SIML 130
C *	ADDED.	* SIML 140
C *		* SIML 150
C	*****	SIML 160
C		SIML 170
C	C-ZERO VECTOR X AND PRINT HEADING	SIML 180
C		SIML 190
	DO 100 L=1,N	SIML 200
	100 X(L)=0.0	SIML 210
	IF (JPRINT) 110,110,120	SIML 220
	120 WRITE (KPRINT,121)	SIML 230
	121 FORMAT('IM D N T E C A R L O SIMULATED DATA',/, '0')	SIML 240
C		SIML 250
C	C-READ IN MODEL SPECIFICATIONS - GENERATE SINES AND ADD NOISE	SIML 260
C	NSIN-NUMBER OF SINE WAVES IN DATA	SIML 270
C	BAND-FREQ. OR PERIOD OF THE LSINTH SINE WAVE	SIML 280
C	SD-STANDARD DEVIATION OF THE LSINTH SINE WAVE. (AMPLITUDE)	SIML 290
C	SDN-STANDARD DEV. OF GAUSSIAN NOISE	SIML 300
C		SIML 310
	110 READ (KREADR,1) NSIN	SIML 320
	1 FORMAT (I5)	SIML 330
	DO 10 LSIN=1,NSIN	SIML 340
	READ (KREADR,2) BAND(1),SD	SIML 350
	2 FORMAT (2F10.0)	SIML 360
	IF (JDOMAN)20,20,30	SIML 370
	30 BAN=BAND(1)	SIML 380
	BAND(1)=1.0/BAND(1)	SIML 390
	GO TO 21	SIML 400
	20 BAN=1.0/BAND(1)	SIML 410
	21 IF (JPRINT) 25,25,22	SIML 420
	22 WRITE (KPRINT,3) LSIN, BAND(1), BAN,SD	SIML 430
	3 FORMAT(' BAND',I3,' - PERIOD=',F10.4,' , FREQUENCY=',F10.4,' , AMPLI	SIML 440
	ITUDE=',F10.4)	SIML 450
	25 AFREQ=6.28318/BAND(1)	SIML 460
	EF=-AFREQ	SIML 470
	DO 26 L=1,N	SIML 480
	EF=EF+AFREQ	SIML 490
	26 A(L)=SIN(EF)*1.41421	SIML 500
	DO 10 L=1,N	SIML 510
	10 X(L)=X(L)+A(L)*SD	SIML 520
C		SIML 530
C	C-READ IN NOISE SD AND NOISE CARDS	SIML 540

C		SIML 550
	READ (KREADR,2) SDN	SIML 560
	IF(SDN) 1000,1000,40	SIML 570
40	IF (JPRINT) 50,50,41	SIML 580
41	WRITE (KPRINT,5) SDN	SIML 590
5	FORMAT('RANDOM GAUSSIAN NOISE AMPLITUDE=',F10.4)	SIML 600
50	READ (KREADR,6) (A(L),L=1,N)	SIML 610
6	FORMAT(4X,10F6.4)	SIML 620
	DO 60 L=1,N	SIML 630
60	X(L)=A(L)*SDN+X(L)	SIML 640
1000	RETURN	SIML 650
	END	SIML 660

C		MATP 10
C		MATP 20
	SUBROUTINE MATPRT(R,M,LVAR)	MATP 30
	DIMENSION R(1),X(15),LVAR(1)	MATP 40
	COMMON KREADR, KPRINT	MATP 50
C		MATP 60
C	*****	MATP 70
C	*	* MATP 80
C	* SUBROUTINE M A T P R T	* MATP 90
C	*	* MATP 100
C	* MATPRT PRINTS OUT THE LOWER TRIANGULAR MATRIX X WHERE X IS STOR-	* MATP 110
C	* ED IN MODE 1. SEE REFERENCE LISTED IN SUBROUTINE PREGEN.	* MATP 120
C	*	* MATP 130
C	*****	MATP 140
C		MATP 150
C	C-LOOP THRU AS MANY TIMES AS NEEDED TO PRINT WHOLE MATRIX, EACH TIME	MATP 160
C	C-PRINTING 15 COLUMNS BY NRO ROWS.	MATP 170
C		MATP 180
	N1=1	MATP 190
	N2=15	MATP 200
	110 IF (N2-M) 100,100,10	MATP 210
	10 N2=M	MATP 220
	100 WRITE (KPRINT,1) (LVAR(LV),LV=N1,N2)	MATP 230
	1 FORMAT('0',2X,15I7)	MATP 240
	WRITE (KPRINT,2)	MATP 250
	2 FORMAT('0')	MATP 260
C		MATP 270
C	C-PRINT ONE ROW AT A TIME. MATRIX R IS MODE 1, UPPER TRIANGULAR.	MATP 280
C	C-THEREFORE REVERSE SUBSCRIPTS TO MAKE LOWER TRIANGULAR.	MATP 290
C		MATP 300
	DO 20 LROW=N1,M	MATP 310
	IF (LROW-N2) 21,21,22	MATP 320
	21 LIMIT=LROW	MATP 330
	GO TO 23	MATP 340
	22 LIMIT=N2	MATP 350
	23 L=0	MATP 360
	DO 30 LCOL=N1,LIMIT	MATP 370
	L=L+1	MATP 380
	CALL LOC(LCOL,LROW,K,M,M,1)	MATP 390
	30 X(L)=R(K)	MATP 400
	20 WRITE (KPRINT,3) (LROW,(X(K),K=1,L))	MATP 410
	3 FORMAT(1X,I3,2X,15F7.3)	MATP 420
	N1=N1+15	MATP 430
	N2=N1+14	MATP 440
	IF (M-N1) 1000,110,110	MATP 450
	1000 RETURN	MATP 460
	END	MATP 470

C		USPT	10
C		USPT	20
	SUBROUTINE USPECT(R,T,N ,M,B,NBANDS,STD,JPRINT,JPLOT,PHASE,BAN,	USPT	30
	1 BANDS,AMNAME,TNAME,PHNAME,XNAME,JDDMAN,BANAME)	USPT	40
	DIMENSION R(1),T(1),B(1),STD(1),PHASE(1),BAN(1),BANDS(1),AMNAME(1)	USPT	50
	1,TNAME(1),PHNAME(1),XNAME(1),BANAME(1)	USPT	60
	COMMON KREADR,KPRINT	USPT	70
C		USPT	80
C	*****	USPT	90
C *		* USPT	100
C	SUBROUTINE U S P E C T	USPT	110
C *		* USPT	120
C *	USPECT COMPUTES THE UNIVARIATE SPECTRUM BY MULTIPLYING THE CORR-	* USPT	130
C *	ELATION OF THE TIME SERIES WITH A SIN OR COS PREDICTOR BY THE	* USPT	140
C *	RATIO OF STANDARD DEVIATIONS OF THE TWO. THIS IS DONE FOR EACH	* USPT	150
C *	PREDICTOR. LET R=THE CORRELATION OF F(T) WITH A SIN OR COS WAVE	* USPT	160
C *	OF SOME ARBITRARY WAVE LENGTH. LET S=THE STANDARD DEVIATION	* USPT	170
C *	OF THE TIME SERIES AND .707=THE STANDARD DEVIATION OF THE PRED-	* USPT	180
C *	ICTOR WAVE. THEN A(F) = R*(S/.707)	* USPT	190
C *	WHERE A(F)=THE AMPLITUDE OF THE COMPLEX SPECTRUM AT F. THE SIN	* USPT	200
C *	AND COS COMPONENTS ARE COMBINED AT EACH WAVE LENGTH AND PHASE	* USPT	210
C *	ANGLE IS COMPUTED. T-VALUES ARE ALSO COMPUTED FOR EACH BAND.	* USPT	220
C *	R=UPPER TRIANGULAR CORRELATION MATRIX, IN STORAGE MODE 1. SEE	* USPT	230
C *	IBM PUBLICATION REFERENCED IN SUBROUTINE PREGEN. (INPUT)	* USPT	240
C *	T=VECTOR OF T-VALUES. (OUTPUT)	* USPT	250
C *	NBBS=NUMBER OF OBSERVATIONS. (INPUT)	* USPT	260
C *	M=TOTAL NUMBER OF DATA VECTORS. M=NBANDS*2 + 1. ONE VECTOR FOR	* USPT	270
C *	THE DEPENDENT VARIABLE AND TWO FOR THE SIN/COS WAVES AT EACH WAVE	* USPT	280
C *	LENGTH. (INPUT). B=VECTOR OF SPECTRUM ESTIMATES. (OUTPUT)	* USPT	290
C *	NBANDS=LENGTH OF VECTORS T,B AND PHASE. (INPUT)	* USPT	300
C *	STD=STANDARD DEVIATIONS OF ALL VARIABLES. (INPUT)	* USPT	310
C *	JPRINT=PRINT CONTROL - SEE MAINLINE. (INPUT)	* USPT	320
C *	JPLOT=PLOT CONTROL - SEE MAINLINE. (INPUT)	* USPT	330
C *	PHASE=VECTOR OF PHASE ANGLES. (OUTPUT)	* USPT	340
C *		* USPT	350
C	*****	USPT	360
	LBAND=0	USPT	370
C		USPT	380
	C-EXTRACT VECTOR OF CORRELATIONS BETWEEN DEPENDENT VARIABLE AND EACH	USPT	390
	C-PREDICTOR VARIABLE.	USPT	400
C		USPT	410
	DO 10 L=2,M	USPT	420
	CALL LOC(1,L,KOOL,M,M,1)	USPT	430
	10 B(L)=R(KOOL)	USPT	440
C		USPT	450
	C-LOOP THRU THE SPECTRUM COMPUTATION NBAND TIMES.	USPT	460
C		USPT	470
	FACT=SQRT(FLOAT(N-2))	USPT	480
	DO 20 L=2,M,2	USPT	490
	K=L+1	USPT	500
	LBAND=LBAND+1	USPT	510
C		USPT	520
	C-CO=COS COMPONENT OF SPECTRUM ESTIMATE	USPT	530
	C-SI=SIN COMPONENT OF SPECTRUM ESTIMATE	USPT	540

C-TC=T-VALUE FOR COS COMPONENT	USPT 550
C-TS=T-VALUE FOR SIN COMPONENT	USPT 560
C	USPT 570
CO=B(L)*STD(1)/.707	USPT 580
SI=B(K)*STD(1)/.707	USPT 590
TC=B(L)*FACT/SQRT(1.0-B(L)**2)	USPT 600
TS=B(K)*FACT/SQRT(1.0-B(K)**2)	USPT 610
C	USPT 620
C-COMPUTE SPECTRUM AMPLITUDE, T-VALUE AND PHASE ANGLE	USPT 630
C	USPT 640
B(LBAND)=SQRT(CO**2 + SI**2)	USPT 650
T(LBAND)=SQRT(TC**2 + TS**2)	USPT 660
20 PHASE(LBAND)=ATAN(CO/SI)	USPT 670
C	USPT 680
C-PRINT AND/OR PLOT IF DESIRED	USPT 690
C	USPT 700
JPR=JPRINT-1	USPT 740
JPL=JPLT-1	USPT 750
IF (JPR) 50,50,60	USPT 760
50 IF (JPL) 1000,1000,60	USPT 770
60 WRITE(KPRINT,1)	USPT 780
1 FORMAT('O S I N G L E B A N D S P E C T R U M')	USPT 790
CALL OUTPUT(BANDS,BAN,B,T,PHASE,NBANDS,AMNAME,TNAME,PHNAME	USPT 800
1,BANAME,XNAME,JPRINT,JPLT,JDOMAN)	USPT 810
1000 RETURN	USPT 820
END	USPT 830

C		PPIK 10
C		PPIK 20
	SUBROUTINE PPIK(B,T,ISAVE,NPEAK,NBANDS,SIGLEV)	PPIK 30
	DIMENSION B(1),T(1),ISAVE(1)	PPIK 40
C		PPIK 50
C	*****	PPIK 60
C *		* PPIK 70
C *	SUBROUTINE P P I K R	* PPIK 80
C *		* PPIK 90
C *	PPIK RETURNS THE VECTOR INDEX OF ALL SIGNIFICANT SPECTRUM PEAKS.	* PPIK 100
C *	B-INPUT VECTOR OF AMPLITUDE SPECTRUM ESTIMATES	* PPIK 110
C *	T-INPUT VECTOR OF T-VALUES FOR EACH SPECTRUM ESTIMATE	* PPIK 120
C *	ISAVE-OUTPUT VECTOR OF INDEX NUMBERS OF SIGNIFICANT PEAKS	* PPIK 130
C *	NPEAK-OUTPUT SCALAR - NUMBER OF PEAKS FOUND	* PPIK 140
C *	NBANDS-INPUT SCALAR - NUMBER OF BANDS IN SPECTRUM	* PPIK 150
C *	SIGLEV-INPUT SCALAR - CRITERION WHICH T-VALUE FOR A PEAK MUST	* PPIK 160
C *	EXCEED IN ORDER TO BE RETAINED	* PPIK 170
C *		* PPIK 180
C	*****	PPIK 190
C		PPIK 200
C	C-SEARCH FOR PEAKS. RETAIN 'SIGNIFICANT' ONES. BUILD ISAVE.	PPIK 210
C		PPIK 220
	NPEAK=0	PPIK 230
	DO 10 L=2,NBANDS	PPIK 240
	IF (B(L-1)-B(L)) 20,10,10	PPIK 250
	20 IF (B(L+1)-B(L)) 40,10,10	PPIK 260
	40 IF (T(L)-SIGLEV) 10,50,50	PPIK 270
	50 NPEAK=NPEAK+1	PPIK 280
	ISAVE(NPEAK)=L	PPIK 290
	10 CONTINUE	PPIK 300
	RETURN	PPIK 310
	END	PPIK 320

C		CRIT 10
C		CRIT 20
	FUNCTION CRIT(RSQ,T,JCRITR,L)	CRIT 30
	DIMENSION T(1)	CRIT 40
C		CRIT 50
C	*****	CRIT 60
C *		* CRIT 70
C *	FUNCTION C R I T R	* CRIT 80
C *		* CRIT 90
C *	CRITR SELECTS A CRITERION FOR THE SPECTRUM OPTIMIZATION BY PEAK	* CRIT 100
C *	SHIFTING. SELECTS EITHER R-SQUARE OR THE APPROPRIATE T VALUE.	* CRIT 110
C *		* CRIT 120
C	*****	CRIT 130
C		CRIT 140
C	C-SELECT APPROPRIATE VALUE FOR CRITERION.	CRIT 150
C	RSQ-INPUT SCALAR - VALUE OF R-SQUARE	CRIT 160
C	T-INPUT VECTOR - T-VALUES	CRIT 170
C	JCRITR-CONTROL DIGIT FOR SELECTION OF EITHER RSQ OR T(L) AS CRITERION	CRIT 180
C	0=RSQ AS CRITERION	CRIT 190
C	1=T-VALUE AS CRITERION	CRIT 200
C	L-INDEX VALUE OF VECTOR T	CRIT 210
C		CRIT 220
	IF (JCRITR) 10,10,20	CRIT 230
10	CRITR=RSQ	CRIT 240
	GO TO 30	CRIT 250
20	CRITR=T(L)	CRIT 260
30	RETURN	CRIT 270
	END	CRIT 280

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C		KSPT 10
C		KSPT 20
	SUBROUTINE <SPECT(R,T,N,M,NPEAK,ISAV,RX,B,JPRINT,XBAR,STD,D,RSQ,	KSPT 30
	1PHASE,BANDS,BAN)	KSPT 40
	DIMENSION ISAVE(100),R(1),T(1),RX(1),B(1),XBAR(1),STD(1),D(1),	KSPT 50
	1PHASE(1),BANDS(1),BAN(1),ANS(10),ISAV(1),RY(100)	KSPT 60
	COMMON KREADR,KPRINT	KSPT 70
	C-CONVERT ISAV TO ISAVE, FROM FREQ BAND VECTOR TO VECTOR OF SIN/COS PAIR	KSPT 80
C		KSPT 90
	98521 FORMAT ('OJKL=',I5)	KSPT 100
	K=0	KSPT 110
	DO 100 L=1,NPEAK	KSPT 120
	K=K+1	KSPT 130
	ISAVE(K)=ISAV(L)*2	KSPT 140
	K=K+1	KSPT 150
	100 ISAVE(K)=ISAVE(K-1)+1	KSPT 160
C		KSPT 170
	C-SELECT SUB-MATRIX OF PREDICTORS ETC FROM R, ACCORDING TO ISAVE.	KSPT 180
C		KSPT 190
	CALL ORDER(M,R,1,K,ISAVE,RX,RY)	KSPT 200
C		KSPT 210
	C-INVERT K-ORDER MATRIX OF PREDICTOR INTERCORRELATIONS, RX	KSPT 220
C		KSPT 230
	CALL MINV(RX,K,DET,B,T)	KSPT 240
	IF (JPRINT-3) 300,400,400	KSPT 250
	400 WRITE (KPRINT,7) DET	KSPT 260
	7 FORMAT('O',/, 'O DETERMINANT =',E30,I5)	KSPT 270
C		KSPT 280
	C-COMPUTE REGRESSIONS(SPECTRUM) FOR NPEAK SIZED MODEL.	KSPT 290
C		KSPT 300
	300 CALL MULTR(N,K,XBAR,STD,D,RX,RY,ISAVE,B,SB,T,ANS)	KSPT 310
	RSQ=ANS(2)**2	KSPT 320
C		KSPT 330
	C-CONVERT SPECTRUM TO AMPLITUDES BY COMBINING SIN/COS. PUT INTO D.	KSPT 340
C		KSPT 350
	C-ALSO CONVERT T.	KSPT 360
C		KSPT 370
	NFREQ=0	KSPT 380
	DO 200 L=1,K,2	KSPT 390
	NFREQ=NFREQ+1	KSPT 400
	PHASE(NFREQ)=ATAN(B(L)/B(L+1))	KSPT 410
	B(NFREQ)=SQRT(B(L)**2 + B(L+1)**2)	KSPT 420
	200 T(NFREQ)=SQRT(T(L)**2 + T(L+1)**2)	KSPT 430
	10 RETURN	KSPT 440
	END	

C		MULT 10
C		MULT 20
	SUBROUTINE MULTI(ISAVE, NPEAK, NBANDS, R, T, N, M, RX, B, XBAR, STD, D, RSQ,	MULT 30
	1 PHASE, BANDS, BAN)	MULT 40
	DIMENSION ISAVE(1), R(1), T(1), RX(1), B(1), XBAR(1), STD(1), D(1), PHASE	MULT 50
	1 (1), BANDS(1), BAN(1), KSAVE(20), S(20), TSPEC(20), TPH(20)	MULT 60
	COMMON KREADR, KPRINT	MULT 70
C		MULT 80
C	*****	MULT 90
C *		* MULT 100
C *	SUBROUTINE M U L T I	* MULT 110
C *		* MULT 120
C *	MULTI COMPUTES THE FULL SPECTRUM OF A TIME SERIES USING A K+1	* MULT 130
C *	BANDS MODEL WHERE K=THE NUMBER OF PEAKS IN THE OPTIMIZED	* MULT 140
C *	MODEL. THE EXTRA BAND IS THE WAVELENGTH IN QUESTION, THE OTHERS	* MULT 150
C *	ARE THE SIGNIFICANT PEAKS. THE VARIANCE ACCOUNTED FOR BY	* MULT 160
C *	THE SIGNIFICANT PEAKS IS THUS 'ACCOUNTED FOR' IN EACH ESTIMATE.	* MULT 170
C *	WHEN THE CURRENT BAND IS ONE OF THE SIGNIFICANT PEAKS, A SKIP	* MULT 180
C *	OCCURS. VARIABLES DEFINED IN MAINLINE.	* MULT 190
C *		* MULT 200
C	*****	MULT 210
C		MULT 220
C		MULT 230
C	C-LOOP THRU ONCE FOR EACH FREQ BAND. NFMOD IS THE NUMBER OF SIGNIFIC-	MULT 240
C	CANT PEAKS IN MODEL PLUS A CURRENT BAND.	MULT 250
C		MULT 260
	NFMOD=NPEAK+1	MULT 270
	DO 310 LF=1, NBANDS	MULT 280
C		MULT 290
C	C-CONSTRUCT NEW ISAVE VECTOR	MULT 300
C		MULT 310
	CALL BUILD(KSAVE, ISAVE, LF, NFMOD, ISKIP, NPEAK)	MULT 320
C		MULT 330
C	C-SKIP IF THIS BAND IS IN THE MODEL ALREADY	MULT 340
C		MULT 350
	IF (ISKIP) 320, 320, 330	MULT 360
C		MULT 370
C	C-BRANCH TO 330 IMPLIES THAT THE CURRENT BAND IS ONE OF THE SIGNIFICANT	MULT 380
C	C-PEAKS. DO AN NPEAK SPECTRUM AND PICK OUT CURRENT BAND.	MULT 390
C		MULT 400
	330 CALLKSPEC(R, S, N, M, NPEAK, ISAVE, RX, TSPEC, O, XBAR, STD, D, RSQ, TPH,	MULT 410
	1BANDS, BAN)	MULT 420
C		MULT 430
C	C-TSPEC CONTAINS ALL MODEL ESTIMATES. PICK THE ONE FOR LF.	MULT 440
C		MULT 450
	DO 331 LLZ=1, NPEAK	MULT 460
	IF (LF-ISAVE(LLZ)) 331, 333, 331	MULT 470
333	B(LF)=TSPEC(LLZ)	MULT 480
	PHASE (LF)=TPH(LLZ)	MULT 490
	T(LF)=S(LLZ)	MULT 500
331	CONTINUE	MULT 510
	GO TO 310	MULT 520
C		MULT 530
C	C-BRANCH TO 320 IMPLIES THAT THIS IS A FULL NFMOD MODEL. DO SPECTRUM	MULT 540

C-AND PICK OUT CURRENT BAND.

MULT 550

C

MULT 560

320 CALLKSPECT(R,S,N,H,NFMOD,KSAVE,RX,TSPEC,O,XBAR,STD,D,RSQ,TPH,

MULT 570

1 BANDS,BAN)

MULT 580

DO 321 LLL=1,NFMOD

MULT 590

IF(LF-KSAVE(LLL)) 321,322,321

MULT 600

322 T(LF)=S(LLL)

MULT 610

B(LF)=TSPEC(LLL)

MULT 620

PHASE (LF)=TPH(LLL)

MULT 630

321 CONTINUE

MULT 640

310 CONTINUE

MULT 650

RETURN

MULT 660

END

MULT 670

C		BILD 10
C		BILD 20
	SUBROUTINE BUILD(KSAVE,ISAVE,LF,NFMOD,ISKIP,NPEAK)	BILD 30
	DIMENSION KSAVE(1),ISAVE(1),ASAVE(30),RANC(30)	BILD 40
C		BILD 50
C	*****	BILD 60
C *		* BILD 70
C	SUBROUTINE B U I L D	BILD 80
C *	BUILD CONSTRUCTS VECTOR OF RANKED FREQ BAND NUMBERS GIVEN A	* BILD 90
C *	PARTICULAR MODEL AND A CURRENT FREQUENCY.	* BILD 100
C *	KSAVE - OUTPUT VECTOR TO BE BUILT	* BILD 110
C *	ISAVE - INPUT VECTOR CONTAINING NFREQ SIGNIF PEAKS	* BILD 120
C *	LF - INPUT SCALAR - NEW FREQ BAND TO BE ADDED (CURRENT ONE)	* BILD 130
C *	NFMOD - INPUT - NUMBER OF FREQ BANDS IN NEW MODEL	* BILD 140
C *	ISKIP - OUTPUT CONTROL DIGIT TO KEEP FROM COMPUTING ESTIMATE	* BILD 150
C *	OF ONE OF THE OLD PEAKS AGAIN	* BILD 160
C *	NPEAK - INPUT - NUMBER OF FREQ BANDS IN OLD MODEL	* BILD 170
C *		* BILD 180
C	*****	BILD 190
C		BILD 200
C	C-SEE IF LF IS ALREADY IN MODEL	BILD 210
C		BILD 220
	DO 10 L=1,NPEAK	BILD 230
	IF(LF - ISAVE(L)) 10,99,10	BILD 240
	10 CONTINUE	BILD 250
C		BILD 260
C	C-STORE VECTOR OF ISAVE PLUS LF INTO ASAVE AND RANK IT. RANK STORED IN	BILD 270
C	C-VECTOR RANC	BILD 280
C		BILD 290
	DO 20 L=1,NPEAK	BILD 300
	20 ASAVE(L)=ISAVE(L)	BILD 310
	ASAVE(NFMOD)=LF	BILD 320
	CALL RANK(ASAVE,RANC,NFMOD)	BILD 330
		BILD 340
C		BILD 350
C	C-BUILD KSAVE OF RANKED FREQ BANDS	BILD 360
C		BILD 370
	DO 30 L=1,NFMOD	BILD 380
	KOOL=RANC(L)	BILD 390
	30 KSAVE(KOOL)=ASAVE(L)	BILD 400
	ISKIP=0	BILD 410
	GO TO 100	BILD 420
	99 ISKIP=1	BILD 430
	100 RETURN	BILD 440
	END	

C		OUTP 10
C		OUTP 20
	SUBROUTINE OUTPUT(BANDS,BAN,B,T,PHASE,NBANDS,AMNAME,TNAME,PHNAME,	OUTP 30
	IBANAME,XNAME,JPRINT,JPLOT,JDOMAIN)	OUTP 40
	DIMENSION BANDS(1),BAN(1),B(1),T(1),PHASE(1),AMNAME(1),TNAME(1),	OUTP 50
	IPHNAME(1),BANAME(1),XNAME(1)	OUTP 60
	COMMON KREADR,KPRINT	OUTP 70
C		OUTP 80
C	*****	OUTP 90
C *		* OUTP 100
C *	SUBROUTINE O U T P U T	* OUTP 110
C *		* OUTP 120
C *	OUTPUT PRINTS AND/OR PLOTS SPECTRA WITH DOCUMENTATION.	* OUTP 130
C *		* OUTP 140
C	*****	OUTP 150
C		OUTP 160
C	C-PRINT OUT DOCUMENTATION AND VECTOR ORDER IN APPROPRIATE DOMAIN)	OUTP 170
C	C-FIND SCALE VALUES AND PLOT	OUTP 180
C		OUTP 190
	TOPI=6.28318	OUTP 200
	BTOPI=-TOPI	OUTP 210
	BMAX=B(1)	OUTP 220
	DO 64 LBAND=2,NBANDS	OUTP 230
	IF (BMAX-B(LBAND)) 68,64,64	OUTP 240
68	BMAX=B(LBAND)	OUTP 250
64	CONTINUE	OUTP 260
	TMAX=T(1)	OUTP 270
	DO 66 LBAND=2,NBANDS	OUTP 280
	IF (TMAX-T(LBAND)) 67,66,66	OUTP 290
67	TMAX=T(LBAND)	OUTP 300
66	CONTINUE	OUTP 310
	IF (JDOMAIN) 60,60,50	OUTP 320
C		OUTP 330
C	C-REVERSE VECTORS IF FREQ DOMAIN IS USED - PRINT - REVERSE AGAIN.	OUTP 340
C		OUTP 350
50	CALL REV(B,NBANDS)	OUTP 360
	CALL REV(T,NBANDS)	OUTP 370
	CALL REV(PHASE,NBANDS)	OUTP 380
	IF (JPRINT) 52,52,51	OUTP 390
51	WRITE (KPRINT,2)	OUTP 400
2	FORMAT('OFREQUENCY ',5X,'AMPLITUDE',5X,'T-VALUE',8X,'PHASE',/, '0')	OUTP 410
	DO 55 LBAND=1,NBANDS	OUTP 420
55	WRITE (KPRINT,3) BAN(LBAND),B(LBAND),T(LBAND),PHASE(LBAND)	OUTP 430
3	FORMAT(F10.3,5X,F9.3,5X,F7.3,5X,F8.3)	OUTP 440
52	IF (JPLOT) 54,54,53	OUTP 450
53	CALL PLOT2(B,BMAX,0.0,T,TMAX,0.0,NBANDS,BAN,AMNAME,TNAME,BANAME)	OUTP 460
	CALL PLOT2(PHASE,TOPI,BTOPI,T,TMAX,0.0,NBANDS,BAN,PHNAME,TNAME,	OUTP 470
1	BANAME)	OUTP 480
54	CALL REV(B,NBANDS)	OUTP 490
	CALL REV(T,NBANDS)	OUTP 500
	CALL REV(PHASE,NBANDS)	OUTP 510
	GO TO 100	OUTP 520
60	IF (JPRINT) 62,62,61	OUTP 530
61	WRITE (KPRINT,4)	OUTP 540

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4	FORMAT('OPERIOD',5X,'AMPLITUDE',5X,'T-VALUE',8X,'PHASE',/, '0')	OUTP 550
	DO 65 LBAND=1,NBANDS	OUTP 560
65	WRITE (KPRINT,3) BANDS(LBAND),B(LBAND),T(LBAND),PHASE(LBAND)	OUTP 570
62	IF (JPLT) 100,100,63	OUTP 580
63	CALL PLOT2(B,8MAX,0.0,T,TMAX,0.0,NBANDS,BANDS,AMNAME,TNAME,XNAME)	OUTP 590
	CALL PLOT2(PHASE,TOPI,BTOPI,T,TMAX,0.0,NBANDS,BANDS,PHNAME,TNAME,	OUTP 600
	1 XNAME)	OUTP 610
100	RETURN	OUTP 620
	END	OUTP 630

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C		PLT2 10
C		PLT2 20
	SUBROUTINE PLOT2(Y1,YMAX1,YMIN1,Y2,YMAX2,YMIN2,NP,XAX,YNAM1,	PLT2 30
	1 YNAM2,XNAM)	PLT2 40
	DIMENSION Y1(1),Y2(1),LINE(111),XAX(1),XNAM(5),YNAM1(9),YNAM2(9)	PLT2 50
	COMMON KREADR,KPRNT	PLT2 60
	DATA KBLNK/' ',KBORD/' ',KAL/'+',KPLOT/'**'/	PLT2 70
C		PLT2 80
C--PLOT2 GENERATES TWO OVER/UNDER	GRAPHS PER PAGE AND CALIBRATES	PLT2 90
C--THEM. Y1=VERTICAL VARIABLE 1, YMAX1, YMIN1=VERTICAL PLOT LIMITS.		PLT2 100
C--Y2, YMAX2, YMIN2=SIMILAR FOR SECON VARIABLE, NP=NUMBER OF POINTS,		PLT2 110
C--XAX=X AXIS (COMMON TO BOTH VARIABLES).		PLT2 120
	WRITE (KPRNT,2) YNAM1,YNAM2,XNAM	PLT2 130
	2 FORMAT('1' / T5,'**'/ T5,'**',T25,'**',T80,'**'/ T5,'**',T25,'****'	PLT2 140
	1,T80,'****'/ T3,'*****',T18,'*****' '9A4,T73,'*****' 'PLT2 150	
	2,9A4/T4,'****',T25,'****', T80,'****'/T5,'**',T25,'**',T80,'**'/1X,5A4)	PLT2 160
C		PLT2 170
C--GENERATE SCALE FACTORS		PLT2 180
	SKAL1=50.5/(YMAX1-YMIN1)	PLT2 190
	SKAL2=50.5/(YMAX2-YMIN2)	PLT2 200
C--GENERATE CALIBRATION AND OUTPUT IT.		PLT2 210
	CAL01 = YMIN1	PLT2 220
	CAL02 = YMIN2	PLT2 230
	CAL1 = YMAX1	PLT2 240
	CAL2 = YMAX2	PLT2 250
	CAL51=YMAX1-(.5*(YMAX1-YMIN1))	PLT2 260
	CAL52=YMAX2-(.5*(YMAX2-YMIN2))	PLT2 270
	WRITE (KPRNT,1) CAL01,CAL51,CAL1,CAL02,CAL52,CAL2	PLT2 280
	1 FORMAT (' ',F14.4,F24.4,F23.4,F12.4,F23.4,F24.4)	PLT2 290
C--GENERATE VERTICAL AXIS AND OUTPUT IT		PLT2 300
	DO 10 L = 1,111	PLT2 310
10	LINE(L) = KBORD	PLT2 320
	LINE(1) = KAL	PLT2 330
	LINE(26) = KAL	PLT2 340
	LINE(51) = KAL	PLT2 350
	LINE(61) = KAL	PLT2 360
	LINE(86) = KAL	PLT2 370
	LINE(111)= KAL	PLT2 380
	DO 20 L=52,60	PLT2 390
20	LINE(L) = KBLNK	PLT2 400
	WRITE(KPRNT,4) LINE	PLT2 410
	4 FORMAT(10X,111A1)	PLT2 420
C		PLT2 430
C--DECIDE HOW MANY LINES BETWEEN POINTS		PLT2 440
	NWIDE = 32/NP	PLT2 450
C		PLT2 460
C--LOOP FOR NUMBER OF POINTS, EACH TIME PLOTTING A POINT AND NWIDE SPACE		PLT2 470
	DO 30 LP = 1, NP	PLT2 480
C		PLT2 490
C--CLEAR LINE AND GENERATE GRID POINTS		PLT2 500
	DO 40 L = 1,111	PLT2 510
40	LINE(L) = KBLNK	PLT2 520
	LINE(1)=KBORD	PLT2 530
	LINE(26)=KBORD	PLT2 540

LINE(51)=KBORD	PLT2 550
LINE(61)=KBORD	PLT2 560
LINE(86)=KBORD	PLT2 570
LINE(111)=KBORD	PLT2 580
C	PLT2 590
C--TEST FOR OVER OR UNDER RANGE AND TRUNCATE OUT-OF-BOUNDS VALUES	PLT2 600
IF (Y1(LP)-YMAX1) 2000, 2000, 2100	PLT2 610
2100 YA = YMAX1	PLT2 620
GO TO 5100	PLT2 630
2000 IF(Y1(LP)-YMIN1) 5000, 5200, 5200	PLT2 640
5000 YA = YMIN1	PLT2 650
GO TO 5100	PLT2 660
5200 YA=Y1(LP)	PLT2 670
5100 IF (Y2(LP)-YMAX2) 200, 200, 210	PLT2 680
210 YB = YMAX2	PLT2 690
GO TO 510	PLT2 700
200 IF (Y2(LP)-YMIN2) 500, 520, 520	PLT2 710
500 YB = YMIN2	PLT2 720
GO TO 510	PLT2 730
520 YB=Y2(LP)	PLT2 740
C	PLT2 750
C--NOW GENERATE POINT INDEXES	PLT2 760
510 K1 = (YA -YMIN1)*SKAL1+1.0	PLT2 770
K2 = (YB -YMIN2)*SKAL2+61.0	PLT2 780
LINE(K1)= KPL0T	PLT2 790
LINE(K2)= KPL0T	PLT2 800
C	PLT2 810
C--OUTPUT HORIZONTAL SCALE VALUE AND LINE	PLT2 820
WRITE (KPRNT ,3) XAX(LP),LINE	PLT2 830
3 FORMAT (1X,F 8.4,1X,111A1)	PLT2 840
C	PLT2 850
C--CLEAR LINE AND GENERATE BLANK LINES FOR SPACE	PLT2 860
IF (NWIDTH) 30,30,110	PLT2 870
110 DO 95 L=1,111	PLT2 880
95 LINE(L)=KBLNK	PLT2 890
LINE(1)=KBORD	PLT2 900
LINE(51)=KBORD	PLT2 910
LINE(26)=KBORD	PLT2 920
LINE(61)=KBORD	PLT2 930
LINE(86)=KBORD	PLT2 940
LINE(111)=KBORD	PLT2 950
C	PLT2 960
C--OUTPUT PLAIN LINE	PLT2 970
DO 90 LOOP=1,NWIDTH	PLT2 980
90 WRITE (KPRNT,4) LINE	PLT2 990
30 CONTINUE	PLT21000
C	PLT21010
C--GENERATE RIGHT BORDER AND OUTPUT	PLT21020
DO 50 L = 1,111	PLT21030
50 LINE(L) = KBORD	PLT21040
LINE(1) = KAL	PLT21050
LINE(51) = KAL	PLT21060
LINE(61) = KAL	PLT21070
LINE(86) = KAL	PLT21080
LINE(111) = KAL	PLT21090
	PLT21100

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DO 80 L= 52,60
80 LINE (L) = KRLNK
WRITE (KPRNT,4) LINE
RETURN
END

PLT21110
PLT21120
PLT21130
PLT21140
PLT21150

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C		TOTM	10
C		TOTM	20
	SUBROUTINE TOTAM(X,N,NPEAK,ISAVE,M,PHASE,B,AMP)	TOTM	30
	DIMENSION X(1),ISAVE(1),PHASE(1),B(1)	TOTM	40
C		TOTM	50
C	*****	TOTM	60
C *		* TOTM	70
C *	SUBROUTINE T O T A M	* TOTM	80
C *		* TOTM	90
C *	TOTAM COMPUTES THE RESULTANT AMPLITUDE OF THE SUM OF NPEAK SIN-	* TOTM	100
C *	SOIDS WHICH HAVE THEIR AMPLITUDES AND PHASES DETERMINED BY THE	* TOTM	110
C *	CALLING PROGRAM.. TOTAM SIMPLY SELECTS THE APPROPRIATE SINE	* TOTM	120
C *	AND COSINE WAVES FROM X, WEIGHTS THEM, SUMS THEM AND THEN COM-	* TOTM	130
C *	PUTES THE AMPLITUDE OF THE SUM.	* TOTM	140
C *	W A R N I N G ----- THIS WILL DESTROY ROW 1 OF X WHICH	* TOTM	150
C *	CONTAINS THE ORIGINAL DEPENDENT VARIABLE.	* TOTM	160
C *		* TOTM	170
C	*****	TOTM	180
C		TOTM	190
C	C-LOOP THRU THE FOLLOWING NPEAK TIMES TO CREATE THE RESULTANT WAVE INX	TOTM	200
C		TOTM	210
	DO 100 LP=1,NPEAK	TOTM	220
	K=ISAVE(LP)	TOTM	230
	KC=K*2	TOTM	240
	KS=KC+1	TOTM	250
C		TOTM	260
C	C-THE FOLLOWING COMPUTES THE PROPER AMPLITUDES FOR THE COSINE AND SINE	TOTM	270
C	C-COMPONENTS, BASED ON PHASE AND AMPLITUDE ESTIMATES.	TOTM	280
C		TOTM	290
	PC=1.0	TOTM	300
	PC=PC/(TAN(PHASE(K))+ PC)	TOTM	310
	PS=PC*TAN(PHASE(K))	TOTM	320
C		TOTM	330
C	C-SELECT SINE AND COSINE VALUES FROM X A	TOTM	340
C	C-SELECT SINE AND COSINE VALUES FROM X, SUM AND PUT INTO X, ROW 1.	TOTM	350
C		TOTM	360
	DO 100 L=1,N	TOTM	370
	CALL LOC(KC,L,J,M,N,0)	TOTM	380
	CALL LOC(KS,L,I,M,N,0)	TOTM	390
	100 X(L)=X(J)*PC + X(I)*PS	TOTM	400
C		TOTM	410
C	C-COMPUTE APPLITUDE OF RESULTANT	TOTM	420
C		TOTM	430
	SX=0.0	TOTM	440
	DO 10 L=1,N	TOTM	450
10	SX=SX+X(L)	TOTM	460
	SX=SX/FL0AT(N)	TOTM	470
	SXS=0.0	TOTM	480
	DO 20 L=1,N	TOTM	490
20	SXS=SXS+(X(L)-SX)**2	TOTM	500
	AMP=SQRT(SXS/FL0AT(N))	TOTM	510
	RETURN	TOTM	520
	END	TOTM	530

SUBROUTINE DATA
RETURN
END

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USE OF SPECT

THE FOLLOWING IS A LIST OF INPUT PARAMETERS AND DATA CARDS AND THEIR INTERPRETATIONS.

JDDMIN-DOMAIN OF ANALYSIS. 0 OR BLANK=PERIOD, 1=FREQUENCY.

JBANDS-HW VECTOR OF FREQUENCY OR PERIOD BANDS WILL BE OBTAINED.

0 OR BLANK=GENERATE ACCORDING TO LIMITS SUBSEQUENTLY READ IN.

1=READ IN A VECTOR OF BANDS TO BE USED FROM CARDS.

NBANDS-HW MANY FREQUENCY OR PERIOD BANDS WILL BE USED.

NORS-THE NUMBER OF OBSERVATIONS IN THE DATA VECTOR

JANALY-HW THE DATA SHALL BE ANALYZED.

0 OR BLANK=DO UNIVARIATE SPECTRUM, SEARCH FOR BEST K-VARIATE

MODEL

1=SIMPLY DO UNIVARIATE SPECTRUM

2=DO K-VARIATE SPECTRUM ACCORDING TO MODEL PARAMETER READ IN

JDATA-TELLS SUBROUTINE DEPVAR WHERE TO GET DATA.

0 OR BLANK=READ FROM CARDS ACCORDING TO FORMAT (10X,7F10.0)

1=GENERATE DATA FROM MODELING PROGRAM CALLED BY DATA. THIS

MODELING PROGRAM WILL ASK FOR MORE CARDS.

JCRITER-SELECTS CRITERION FOR OPTIMIZATION OF K-VARIATE SPECTRUM.

0 OR BLANK=MULTIPLE R-SQUARED

1=T-VALUES

JPRINT-PRINTOUT CONTROL DIGIT

0=DONT PRINT ANY RESULTS

1=PRINT ONLY FINAL RESULTS

2=PRINT FINAL AND INTERMEDIATE RESULTS

3=PRINT AS FOR 2 PLUS MATRICES, CORRELATIONS, ETC FOR EACH STEP

JPLOT-PLOT CONTROL DIGIT. - VALUES AS ABOVE EXCEPT FOR 3.

BANDLO-LOWEST FREQ. OR LONGEST PERIOD, AS APPROPRIATE TO DOMAIN.

BANDHI-DELTA(FREQ.) OR DELTA(PERIOD), AS APPROPRIATE TO DOMAIN.

BANDS-VECTOR OF BANDS.

NSIN-NUMBER OF SINE WAVES IN SIMULATED DATA.

BAND-FREQ. OR PERIOD OF THE LSINTH SIMULATED SINE WAVE

SD-STANDARD DEVIATION OF THE LSINTH SIMULATED SINE WAVE. (AMPLITUDE)

SDN-STANDARD DEV. OF GAUSSIAN NOISE

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THE FOLLOWING IS A LIST OF INPUT CARDS AND THEIR CONTENTS

CARD 1 - - - MANDATORY			
COLUMN	VARIABLE	COMMENTS - - -	
1 - 5	JDDMAN	RIGHT JUSTIFY	
6 - 10	JBANDS	RIGHT JUSTIFY	
11 - 15	NBANDS	RIGHT JUSTIFY	
16 - 20	NBRS	RIGHT JUSTIFY	
21 - 25	JANALY	RIGHT JUSTIFY	
26 - 30	JDATA	RIGHT JUSTIFY	
31 - 35	JCRITR	RIGHT JUSTIFY	
36 - 40	JPRINT	RIGHT JUSTIFY	
41 - 45	JPLOT		
CARD 2 - - - REQUIRED ONLY IF JBANDS=0, OTHERWISE OMIT.			
COLUMN	VARIABLE	COMMENTS - - -	
1 - 10	BANDLO	PUNCH DECIMAL	
11 - 20	BANDEL	PUNCH DECIMAL	
CARDS 3 - - - REQUIRED ONLY IF JBANDS=1.			
COLUMN	VARIABLE	COMMENTS - - -	
1 - 10	BANDS(1)	PUNCH DECIMAL - 1ST BAND IN SPECTRUM.	
11 - 20	BANDS(2)	PUNCH DECIMAL - 2ND BAND IN SPECTRUM.	
* * CONTINUE FOR AS MANY CARDS AS NEEDED TO READ IN NBANDS BANDS. FORMAT(3F10.0)			
CARDS 4 - - - REQUIRED ONLY IF JDATA=0.			
COLUMN	VARIABLE	COMMENTS - - -	
1 - 10	ID CODE	MAY CONTAIN ANYTHING - NOT READ.	
11 - 20	DATA(1)	1ST DATA POINT. PUNCH DECIMAL OR RIGHT JUSTIFY.	
21 - 30	DATA(2)	2ND DATA POINT. PUNCH DECIMAL OR RIGHT JUSTIFY.	
* * CONTINUE SAME FORMAT ON CARDS AS NEEDED FOR NOBS DATA POINTS. FORMAT(10X,7F10.0)			
CARDS 5 - - - REQUIRED ONLY IF JDATA=1.			
5A - - MANDATORY.			
COLUMN	VARIABLE	COMMENTS - - -	
1 - 5	NSIN	RIGHT JUSTIFY.	
5B - - REQUIRED ONLY IF NSIN IS NOT ZERO.			
COLUMN	VARIABLE	COMMENTS - - -	
1 - 10	BAND(1)	PUNCH DECIMAL.	
11 - 20	SD(1)	PUNCH DECIMAL.	
CONTINUE SAME FORMAT THRU NSIN CARDS (BANDS). FORMAT(2F10.0)			
5C - - MANDATORY			
COLUMN	VARIABLE	COMMENTS - - -	
1 - 10	SDN	PUNCH DECIMAL	
5D - - REQUIRED ONLY IF SDN IS NOT ZERO			
COLUMN	VARIABLE	COMMENTS - - -	
1 - 5	ID CODE	MAY CONTAIN ANYTHING - NOT READ.	
6 - 10	NIISF(1)	PUNCH DECIMAL. 1ST GAUSSIAN RANDOM NUMBER.	
11 - 16	NIISF(2)	PUNCH DECIMAL. 2ND GAUSSIAN RANDOM NUMBER.	
* * CONTINUE FOR AS MANY CARDS AS NEEDED FOR NOBS RANDOM NUMBERS. FORMAT(4X,10F7.4)			

xxxvii

xxxvii

Line	Code	Text	Line	Code	Text
1	C		10	SPT	10
2	C		20	SPT	20
3	C	*****	30	SPT	30
4	C	*****	40	SPT	40
5	C		50	SPT	50
6	C		60	SPT	60
7	C	DIMENSION BANDS(50),BAN(50),PEAKS(50),PHASE(50),AMNAME(9),TNAME	70	SPT	70
8	C	1(9),PNAME(9),BANAME(5),XNAME(5),LVAR(100),ISAVE(100)	80	SPT	80
9	C		90	SPT	90
10	C	C-THE FOLLOWING DIMENSION MUST BE EQUAL TO OR GREATER THAN	100	SPT	100
11	C	C- NDBS*(NBANDS*2+1)	110	SPT	110
12	C		120	SPT	120
13	C	DIMENSION X(30000)	130	SPT	130
14	C		140	SPT	140
15	C	C-THE FOLLOWING DIMENSIONS MUST BE EQUAL TO OR GREATER THAN NBANDS*2+1	150	SPT	150
16	C		160	SPT	160
17	C	DIMENSION XBAR(100),STD(100),B(100),D(100),T(100)	170	SPT	170
18	C		180	SPT	180
19	C	C-THE FOLLOWING DIMENSION MUST BE EQUAL TO OR GREATER THAN	190	SPT	190
20	C	C- M*M, WHERE M=2*NBANDS+1	200	SPT	200
21	C		210	SPT	210
22	C	DIMENSION RX(10000)	220	SPT	220
23	C		230	SPT	230
24	C	C-THE FOLLOWING DIMENSION MUST BE EQUAL TO OR GREATER THAN (M+1)*M/2	240	SPT	240
25	C		250	SPT	250
26	C	DIMENSION R(5050)	260	SPT	260
27	C	COMMON KREADR,KPRINT	270	SPT	270
28	C	DATA AMNAME/'AMPL','ITUD','E ES','IMAT','E. ',' ',' ',' '	280	SPT	280
29	C	1',' ' /	290	SPT	290
30	C	DATA TNAME/'T-VA','LUE. ',' ' ',' ' ',' ' ',' ' '	300	SPT	300
31	C	1',' ' /	310	SPT	310
32	C	DATA PHNAME/'PHAS','E ES','TINA','TE. ',' ' ',' ' ',' ' '	320	SPT	320
33	C	1',' ' /	330	SPT	330
34	C	DATA BANAME/'FREQ','UENC','Y ',' ' ',' ' /	340	SPT	340
35	C	DATA XNAME/'PERI','OD ',' ' ',' ' /	350	SPT	350
36	C	KREADR=5	360	SPT	360
37	C	KPRINT=6	370	SPT	370
38	C		380	SPT	380
39	C	C-READ IN CONTROL DIGITS AS FOLLOWS AND PRINT THEM OUT.	390	SPT	390
40	C	C JDOMAN-DOMAIN OF ANALYSIS. 0 OR BLANK=PERIOD, 1=FREQUENCY.	400	SPT	400
41	C	C JBANDS-HOW VECTOR OF FREQUENCY OR PERIOD BANDS WILL BE OBTAINED.	410	SPT	410
42	C	C 0 OR BLANK=GENERATE ACCORDING TO LIMITS SUBSEQUENTLY READ IN.	420	SPT	420
43	C	C 1=READ IN A VECTOR OF BANDS TO BE USED FROM CARDS.	430	SPT	430
44	C	C NBANDS-HOW MANY FREQUENCY OR PERIOD BANDS WILL BE USED.	440	SPT	440
45	C	C NOBS-THE NUMBER OF OBSERVATIONS IN THE DATA VECTOR	450	SPT	450
46	C	C JANALY-HOW THE DATA SHALL BE ANALYZED.	460	SPT	460
47	C	C 0 OR BLANK=DO UNIVARIATE SPECTRUM, SEARCH FOR BEST K-VARIATE	470	SPT	470
48	C	C MODEL	480	SPT	480
49	C	C 1=SIMPLY DO UNIVARIATE SPECTRUM	490	SPT	490
50	C	C 2=DO K-VARIATE SPECTRUM ACCORDING TO MODEL PARAMETER READ IN	500	SPT	500
51	C	C JDATA-TELLS SUBROUTINE DEPVAR WHERE TO GET DATA.	510	SPT	510
52	C	C 0 OR BLANK=READ FROM CARDS ACCORDING TO FORMAT (10X,7F10.0)	520	SPT	520
53	C	C 1=GENERATE DATA FROM MODELING PROGRAM CALLED BY DATA. THIS	530	SPT	530
54	C	C MODELING PROGRAM WILL ASK FOR MORE CARDS.	540	SPT	540

C	JCRITR-SELECTS CRITERION FOR OPTIMIZATION OF K-VARIATE SPECTRUM.	SPT	550
C	0 OR BLANK=MULTIPLE R-SQUARED	SPT	560
C	1=T-VALUES	SPT	570
C	JPRINT-PRINTOUT CONTROL DIGIT	SPT	580
C	0=DONT PRINT ANY RESULTS	SPT	590
C	1=PRINT ONLY FINAL RESULTS	SPT	600
C	2=PRINT FINAL AND INTERMEDIATE RESULTS	SPT	610
C	3=PRINT AS FOR 2 PLUS MATRICES, CORRELATIONS, ETC FOR EACH STEP	SPT	620
C	JPLOT-PLLOT CONTROL DIGIT. - VALUES AS ABOVE EXCEPT FOR 3.	SPT	630
C		SPT	640
	READ (KREADR,1) JDOMAN,JBANDS,NBANDS,NOBS,JANALY,JDATA,JCRITR,	SPT	650
	1 JPRINT,JPLOT	SPT	660
	1 FORMAT (16I5)	SPT	670
	WRITE (KPRINT,103)	SPT	680
103	FORMAT ('1 * * * * * PROGRAM PARAMETERS * * * * *')	SPT	690
	WRITE (KPRINT,1)JDOMAN,JBANDS,NBANDS,NOBS,JANALY,JDATA,JCRITR,	SPT	700
	1 JPRINT,JPLOT	SPT	710
C		SPT	720
C	KTOP =MAX NUMBER OF TIMES THE PROGRAM WILL BE ALLOWED TO TRY IMPROVE-	SPT	730
C	MENTS ON THE WHOLE MULTIVARIATE SPECTRUM. KOUNT IS THE NUMBER OF	SPT	740
C	SUCH TRIES.	SPT	750
C		SPT	760
	KTOP=4	SPT	770
	KOUNT=0	SPT	780
C		SPT	790
C	SET SIGLEV, THE T-VALUE FOR THE CRITERION OF ACCEPTANCE OF A PEAK.	SPT	800
C	THEN DECIDE HOW TO GET VECTOR OF BANDS.	SPT	810
C		SPT	820
	SIGLEV=2.0	SPT	830
	IF (JBANDS) 100,100,110	SPT	840
C		SPT	850
C	READ IN LIMITS OF BANDS VECTOR IF JBANDS WAS 0 - GENERATE BANDS.	SPT	860
C	OTHERWISE GO TO 110 AND READ IN BANDS FROM CARDS.	SPT	870
C	BANDLO-LOWEST FREQ. OR LONGEST PERIOD, AS APPROPRIATE TO DOMAIN.	SPT	880
C	BANDEL-DELTA(FREQ.) OR DELTA(PERIOD), AS APPROPRIATE TO DOMAIN.	SPT	890
C	BANDS-VECTOR OF BANDS.	SPT	900
C		SPT	910
100	READ (KREADR,2) BANDLO,BANDEL	SPT	920
	2 FORMAT (8F10.0)	SPT	930
	BANDS(1)=BANDLO	SPT	940
	DO 120 LBAND=2,NBANDS	SPT	950
120	BANDS(LBAND)=BANDS(LBAND-1) + BANDEL	SPT	960
	GO TO 130	SPT	970
110	READ (KREADR,2) (BANDS(LBAND),LBAND=1,NBANDS)	SPT	980
C		SPT	990
C	CONVERT BANDS TO PERIOD DOMAIN IF ORIGINATED IN FREQ DOMAIN.	SPT	1000
C	REVERSE THE ORDER OF BANDS SO AS TO BE IN ASCENDING WAVELENGTH ORDER.	SPT	1010
C	ALSO GENERATE BAN, THE FREQ DOMAIN VECTOR OF BANDS.	SPT	1020
C		SPT	1030
130	IF (JDOMAN) 150,150,140	SPT	1040
140	DO 141 LBAND=1,NBANDS	SPT	1050
	BAN(LBAND)=BANDS(LBAND)	SPT	1060
141	BANDS(LBAND)=1.0/BANDS(LBAND)	SPT	1070
	CALL REV(BANDS,NBANDS)	SPT	1080
C		SPT	1090
C	GENERATE SIN/COS PREDICTOR MATRIX AS PART OF DATA MATRIX, X. THEN	SPT	1100

C-READ IN DEPENDENT VARIABLE PART OF X. THESE DATA WILL THEN BE ENT-	SPT 1110
C-ERED INTO SUBROUTINE CORRE TO COMPUTE THE CORRELATION MATRIX OF ALL	SPT 1120
C-VARIABLES.	SPT 1130
C	SPT 1140
150 M=NBANDS*2 + 1	SPT 1150
CALL PREGEN(X,BANDS,NOBS,NBANDS)	SPT 1160
CALL DEPVAR(X,NOBS,JDATA,JDOMAN,JPRINT)	SPT 1170
C	SPT 1180
C-GENERATE VECTOR OF VARIABLE NUMBERS FOR LATER USE.	SPT 1190
C	SPT 1200
DO 155 LV=1,M	SPT 1210
155 LVAR(LV)=LV	SPT 1220
CALL CORRE(NOBS,M,1,X,XBAR,STD,RX,R,B,D,T)	SPT 1230
C	SPT 1240
C-SET TOPP, THE MAXIMUM ALLOWABLE TOTAL AMPLITUDE IN THE FINAL SPECTRUM	SPT 1250
C-TOPP IS THE TOTAL AMPLITUDE OF THE F(T)+25 PERCENT.	SPT 1260
C	SPT 1270
TOPP=STD(1)+.25*STD(1)	SPT 1280
C	SPT 1290
C-PRINT OUT MATRICES ETC., IF DESIRED	SPT 1300
C	SPT 1310
IF(JPRINT-3) 151,152,152	SPT 1320
152 WRITE (KPRINT,5)	SPT 1330
5 FORMAT('M A T R I X O F C O R R E L A T I O N S',/, ' V A R I A B S	SPT 1340
1LE 1 IS THE DEPENDENT VARIABLE, ALL OTHERS ARE COSINE AND SINE WAVS	SPT 1350
2ES OF VARIOUS PERIODS ',/,T88,'-----',/, 'O')	SPT 1360
CALL MATPRT(R,M,LVAR)	SPT 1370
C	SPT 1380
C-DECIDE ON PROPER DATA ANALYSIS PATH.	SPT 1390
C	SPT 1400
151 JANALY=JANALY+1	SPT 1410
GO TO (200,400,600),JANALY	SPT 1420
C	SPT 1430
C	SPT 1440
C*****	SPT 1450
C*****	SPT 1460
C	SPT 1470
C	SPT 1480
C-STATEMENTS 200-400 INVOLVE COMPUTATION OF OPTIMIZED K-BANDS SPECTRA	SPT 1490
C	SPT 1500
C-FIRST COMPUTE UNIVARIATE SPECTRUM USING SUBROUTINE USPECT. THEN FIND	SPT 1510
C-ALL SIGNIFICANT SPECTRUM PEAKS IN UNIVARIATE SPECTRUM.	SPT 1520
C	SPT 1530
200 CALL USPECT(R,T,NOBS,M,B,NBANDS,STD,JPRINT,JPLOT,PHASE,BAN,BANDS	SPT 1540
1,AMNAME,TNAME,PHNAME,XNAME,JDOMAN,BANAME)	SPT 1550
CALL PPIKR(B,T,ISAVE,NPEAK,NBANDS,SIGLEV)	SPT 1560
IF (NPEAK) 201,201,202	SPT 1570
201 WRITE (KPRINT,66)	SPT 1580
66 FORMAT('O* * * * NO SIGNIFICANT PEAKS FOUND * * *')	SPT 1590
GO TO 2000	SPT 1600
C	SPT 1610
C-NOW LOOP THRU AN OPTIMIZING PROCESS TRYING TO FIND LARGEST VALUE OF	SPT 1620
C-EITHER T OR R-SQUARE. THE BEGINNING OF THIS LOOP IS STATEMENT 210	SPT 1630
C	SPT 1640
C-SET A VALUE OF CRIT=0. THIS WILL LATER BE USED TO STORE THE JUST	SPT 1650
C-PRECEDING VALUE OF THE OPTIMIZATION CRITERION. ALSO INITIALIZE THE	SPT 1660

C-VARIABLE MM =-1. MM IS THE DIRECTION OF PEAK SLIDING AS WELL AS THE	SPT 1670
C-COUNTER FOR THE NUMBER OF STEPS.	SPT 1680
C	SPT 1690
202 LPEAK=1	SPT 1700
CRIT=0.0	SPT 1710
MM=0	SPT 1720
210 CALL KSPECT(R,T,NOBS,M,NPEAK,ISAVE,RX,B,JPRINT,XBAR,STD,D,RSQ,	SPT 1730
1PHASE,BANDS,BAN)	SPT 1740
C	SPT 1750
C-TEST FOR PRINTOUT	SPT 1760
C	SPT 1770
IF(JPRINT-3)208,209,209	SPT 1780
209 WRITE (KPRINT,6) RSQ	SPT 1790
6 FORMAT ('MULTIPLE SQUARED CORRELATION=',F8.4)	SPT 1800
WRITE (KPRINT,7)	SPT 1810
7 FORMAT(' PERIOD/FREQ.','T20,'AMPLITUDE',T40,'T-VALUE')	SPT 1820
DO 214 LO=1,NPEAK	SPT 1830
KK=ISAVE(LO)	SPT 1840
IF (JDOMAN) 212,212,213	SPT 1850
212 BB=BANDS(KK)	SPT 1860
GO TO 214	SPT 1870
213 BB=BAN(KK)	SPT 1880
214 WRITE (KPRINT,8) BB,B(KK),T(KK)	SPT 1890
8 FORMAT (2F12.4,F18.4)	SPT 1900
C	SPT 1910
C-SELECT CRITERION FOR GOODNESS OF FIT - CHECK FOR IMPROVEMENT	SPT 1920
C	SPT 1930
208 IF (CRITR(RSQ,T,JCRITR,LPEAK)-CRIT) 220,220,230	SPT 1940
C	SPT 1950
C-A BRANCH TO 220 IMPLIES NON-IMPROVEMENT. EITHER RESORE OLD VALUE AND	SPT 1960
C-GO TO NEXT PEAK (221 OR 223). OR TRY MOVING UP (222).	SPT 1970
C	SPT 1980
220 IF (MM+1) 221,222,223	SPT 1990
C	SPT 2000
C-A BRANCH TO 221 IMPLIES THAT WE HAVE BEEN MOVING DOWN FOR 2 OR MORE	SPT 2010
C-STEPS. THIS IS THE FIRST NON-IMPROVEMENT. RESTORE JUST FORMER VALUE	SPT 2020
C-AND GO TO NEXT PEAK.	SPT 2030
C	SPT 2040
221 ISAVE(LPEAK)=ISAVE(LPEAK)+1	SPT 2050
MM=-1	SPT 2060
LPEAK=LPEAK+1	SPT 2070
ISAVE(LPEAK)=ISAVE(LPEAK)-1	SPT 2080
GO TO 300	SPT 2090
C	SPT 2100
C-A BRANCH TO 222 IMPLIES FIRST MOVE DOWN AND NON-IMPROVEMENT. TRY	SPT 2110
C-MOVING SAME PEAK UP	SPT 2120
C	SPT 2130
222 MM=1	SPT 2140
ISAVE(LPEAK)=ISAVE(LPEAK)+2	SPT 2150
IF ((ISAVE(LPEAK)-NRANDS) 300,225,225	SPT 2160
225 WRITE (KPRINT,3)	SPT 2170
3 FORMAT ('*** * * W A R N I N G * - JUST TRIED TO MOVE A PEAK IN	SPT 2180
1 TO THE LONGEST PERIOD (LOWEST FREQUENCY) BAND. TRY WIDER SPECTRUM	SPT 2190
2 LIMITS.')	SPT 2200
GO TO 2000	SPT 2210
C	SPT 2220

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C-A BRANCH TO 223 IMPLIES THAT WE HAVE BEEN MOVING UP AND IT DIDNT HELP.	SPT 2230
C-RESTORE JUST PRIOR VALUE AND GO TO NEXT PEAK.	SPT 2240
C	SPT 2250
223 ISAVE(LPEAK)=ISAVE(LPEAK)-1	SPT 2260
MM=-1	SPT 2270
LPEAK=LPEAK+1	SPT 2280
ISAVE(LPEAK)=ISAVE(LPEAK)-1	SPT 2290
GO TO 300	SPT 2300
C	SPT 2310
C	SPT 2320
C-A BRANCH TO 230 IMPLIES IMPROVEMENT. CONTINUE IN SAME DIRECTION.	SPT 2330
C	SPT 2340
230 IF (MM) 231,231,232	SPT 2350
C	SPT 2360
C-A BRANCH TO 231 IMPLIES WE WERE MOVING DOWN. - CONTINUE SAME DIRECTION	SPT 2370
C	SPT 2380
231 MM=MM-1	SPT 2390
CRIT=CRITR(RSQ,T,JCRITR,LPEAK)	SPT 2400
ISAVE(LPEAK)=ISAVE(LPEAK)-1	SPT 2410
IF (ISAVE(LPEAK)-1) 234,234,300	SPT 2420
234 WRITE (KPRINT,4)	SPT 2430
* FORMAT('0** * * * W A R N I N G * - JUST TRIED TO MOVE A PEAK INTO	SPT 2440
THE SHORTEST PERIOD (HIGHEST FREQUENCY) BAND. TRY WIDER SPECTRUM	SPT 2450
2M LIMITS')	SPT 2460
GO TO 2000	SPT 2470
C	SPT 2480
C-A BRANCH TO 232 IMPLIES WE WERE MOVING UP. - CONTINUE SAME DIRECTION.	SPT 2490
C	SPT 2500
232 MM=MM+1	SPT 2510
CRIT=CRITR(RSQ,T,JCRITR,LPEAK)	SPT 2520
ISAVE(LPEAK)=ISAVE(LPEAK)+1	SPT 2530
IF (ISAVE(LPEAK)-NBANDS) 300,225,225	SPT 2540
C	SPT 2550
C	SPT 2560
C-STATEMENT 300 CHECKS TO SEE THAT WE ARE NOT OFF THE END OF THE ISAVE	SPT 2570
C-VECTOR. IF NOT, DO ANOTHER K-BANDS SPECTRUM WITH NEW ISAVE VECTOR	SPT 2580
C-VALUES. IF WE ARE OFF THE END, COMPUTE A NEW FULL SPECTRUM USING A	SPT 2590
C-K-VARIATE MODEL. ALSO CHECK FOR VALUES OF ISAVE EQUAL TO EACH OTHER.	SPT 2600
C-IF WE HAVE JUST MOVED INTO A ANOTHER PEAK, REDUCE NPEAK BY ONE AND	SPT 2610
C-PACK THE VECTOR DOWN AND START PROCESS OVER AT LPEAK=1.	SPT 2620
C	SPT 2630
300 IF (LPEAK-NPEAK) 320,320,310	SPT 2640
320 IF (LPEAK-1) 322,322,321	SPT 2650
321 IF (ISAVE(LPEAK)-ISAVE(LPEAK-1)) 322,323,322	SPT 2660
322 IF (LPEAK-NPEAK) 324,210,324	SPT 2670
324 IF (ISAVE(LPEAK)-ISAVE(LPEAK+1)) 210,325,210	SPT 2680
323 DO 330 LL=LPEAK,NPEAK	SPT 2690
330 ISAVE(LL-1)=ISAVE(LL)	SPT 2700
NPEAK=NPEAK-1	SPT 2710
LPEAK=1	SPT 2720
MM=0	SPT 2730
CRIT=0.0	SPT 2740
GO TO 210	SPT 2750
325 NPEAK=NPEAK-1	SPT 2760
DO 331 LL=LPEAK,NPEAK	SPT 2770
331 ISAVE(LL)=ISAVE(LL+1)	SPT 2780

LPEAK=1	SPT 2790
MM=0	SPT 2800
CRIT=0.0	SPT 2810
GO TO 210	SPT 2820
C	SPT 2830
C-A BRANCH TO 310 OCCURS WHEN OPTIMIZATION OF THE K-BANDS MODEL IS	SPT 2840
C-COMLETE. NOW COMPUTE A FULL SPECTRUM USING THE OPTIMIZED K-BANDS	SPT 2850
C-MODEL. SEARCH NEW K-B SPECTRUM FOR PEAKS AND SEE IF ANY NEW ONES TUR-	SPT 2860
C-NEO UP. IF SO, GO THRU WHOLE OPTIMIZATION ROUTINE AGAIN.	SPT 2870
C	SPT 2880
310 IF (JPRINT-3) 360,361,361	SPT 2890
361 WRITE (KPRINT,9)	SPT 2900
9 FORMAT('COMPUTING SPECTRUM USING THE FOLLOWING BANDS IN MODEL')	SPT 2910
IF (JDOMAN) 362,362,363	SPT 2920
362 DO 364 LO=1,NPEAK	SPT 2930
KK=ISAVE(LO)	SPT 2940
364 WRITE (KPRINT,8) BANDS(KK)	SPT 2950
GO TO 360	SPT 2960
363 DO 366 LO=1,NPEAK	SPT 2970
KK=ISAVE(LO)	SPT 2980
366 WRITE (KPRINT,8) BAN(KK)	SPT 2990
360 CALL MULTI(ISAVE,NPEAK,NBANDS,R,T,NOBS,M,RX,B,XBAR,STD,D,RSQ,	SPT 3000
1 PHASE,BANDS,BAN)	SPT 3010
KOUNT=KOUNT+1	SPT 3020
IF (KOUNT-KTOP) 384,384,385	SPT 3030
385 WRITE (KPRINT,386)	SPT 3040
386 FORMAT('THE PROGRAM IS PROBABLY CAUGHT IN A LOOP. TRY DIFFERENT	SPT 3050
INPUT PARAMETERS AND SUBMIT AGAIN')	SPT 3060
GO TO 2000	SPT 3070
384 CALL PPIKR(B,T,ISAVE,NPEEK,NBANDS,SIGLEV)	SPT 3080
IF (NPEAK-NPEEK) 311,350,311	SPT 3090
311 NPEAK=NPEEK	SPT 3100
LPEAK=1	SPT 3110
MM=0	SPT 3120
CRIT=0.0	SPT 3130
GO TO 210	SPT 3140
C	SPT 3150
C-A STABLE STATE IN THE OPTIMIZING ROUTINE RESULTS IN A BRANCH TO 350.	SPT 3160
C-OUTPUT RESULTS.-	SPT 3170
C	SPT 3180
350 WRITE (KPRINT,67)	SPT 3190
67 FORMAT('O M U L T I P L E B A N D S P E C T R U M')	SPT 3200
CALL OUTPUT(BANDS,BAN,B,T,PHASE,NBANDS,AMNAME,TNAME,PHNAME,	SPT 3210
1BANAME,XNAME,JPRINT,JPLOT,JDOMAN)	SPT 3220
WRITE (KPRINT,6) RSQ	SPT 3230
C	SPT 3240
C-CHECK FINAL SPECTRUM FOR EXCESSIVE TOTAL POWER IN SIGNIFICANT BANDS.	SPT 3250
C	SPT 3260
CALL TOTAN(X,NOBS,NPEAK,ISAVE,M,PHASE,B,SUMB)	SPT 3270
IF(SUMB-TOPP) 381,382,382	SPT 3280
382 WRITE (KPRINT,383)	SPT 3290
383 FORMAT('PROGRAM FAILED BY FINDING TOO MUCH POWER IN THE SPECTRUM.	SPT 3300
1',/, ' SUGGEST ALTERING PARAMETERS OF THE ANALYSIS, SUCH AS',/,	SPT 3310
2' USE WIDER SPECTRUM LIMITS, FILTER DATA, ALTER DELTAP, ETC.')	SPT 3320
381 GO TO 2000	SPT 3330
C	SPT 3340

C		SPT 3350
C*****		SPT 3360
C*****		SPT 3370
C		SPT 3380
C		SPT 3390
C-STATEMENTS 400-500 INVOLVE COMPUTATION OF THE SIMPLE, SINGLE BAND		SPT 3400
C-SPECTRUM ONLY.		SPT 3410
C		SPT 3420
400 CALL USPECT(R,T,NOBS,M,B,NBANDS,STD,JPRINT,JPLOT,PHASE,BAN,BANDS,		SPT 3430
1 AMNAME,TNAME,PHNAME,XNAME,JDDMAN,BANAME)		SPT 3440
GO TO 2000		SPT 3450
C		SPT 3460
C		SPT 3470
C*****		SPT 3480
C*****		SPT 3490
C		SPT 3500
C		SPT 3510
C-STATEMENTS 600-800 INVOLVE COMPUTATION OF A SPECIFIC K-BAND MODEL		SPT 3520
C-WITHOUT OPTIMIZATION.		SPT 3530
C		SPT 3540
C-FIRST READ IN MODEL PARAMETERS, BUILD VECTOR OF BANDS IN MODEL, THEN		SPT 3550
C-COMPUTE SPECTRUM.		SPT 3560
C		SPT 3570
600 READ (KREADR,1) NPEAK		SPT 3580
READ (KREADR,2) (PEAKS(LPEAK),LPEAK=1,NPEAK)		SPT 3590
DO 610 LPEAK=1,NPEAK		SPT 3600
DO 620 LBAND=1,NBAND		SPT 3610
IF (PEAKS(LPEAK)-RANDS(LBAND)) 620,630,620		SPT 3620
630 ISAVE(LPEAK)=LBAND		SPT 3630
GO TO 610		SPT 3640
620 CONTINUE		SPT 3650
610 CONTINUE		SPT 3660
CALL MULTI(ISAVE,NPEAK,NBANDS,R,T,NOBS,M,RX,B,XBAR,STD,D,RSQ,		SPT 3670
1 PHASE,BANDS,BAN)		SPT 3680
WRITE (KPRINT,5)		SPT 3690
CALL OUTPUT(BANDS,BAN,B,T,PHASE,NBANDS,ANAME,TNAME,PHNAME,		SPT 3700
1 BANAME,XNAME,JPRINT,JPLOT,JDDMAN)		SPT 3710
WRITE (KPRINT,6) RSQ		SPT 3720
2000 STOP		SPT 3730
END		SPT 3740

C		REV	10
C		REV	20
	SUBROUTINE REV(X,N)	REV	30
	DIMENSION X(50)	REV	40
C		REV	50
C	*****	REV	60
C *		* REV	70
C *	SUBROUTINE R E V	* REV	80
C *		* REV	90
C *	REV TAKES A VECTOR AND REVERSES ITS ORDER.	* REV	100
C *		* REV	110
C	*****	REV	120
C		REV	130
	J=N+1	REV	140
	MID=N/2	REV	150
	DO 10 L=1,MID	REV	160
	J=J-1	REV	170
	SAVE=X(L)	REV	180
	X(L)=X(J)	REV	190
10	X(J)=SAVE	REV	200
	RETURN	REV	210
	END	REV	220

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C		PRED 10
C		PRED 20
	SUBROUTINE PREGEN(X,BANDS,NOBS,NBANDS)	PRED 30
	DIMENSION X(1),BANDS(1)	PRED 40
C		PRED 50
C	*****	PRED 60
C *		* PRED 70
C *	SUBROUTINE P R E G E N	PRED 80
C *		* PRED 90
C *	PREGEN GENERATES THE SINE AND COSINE PREDICTOR WAVES AND STORES	* PRED 100
C *	THEM IN MATRIX X. MATRIX X IS THE DATA MATRIX HAVING NOBS ROWS	* PRED 110
C *	AND M COLUMNS. HERE NOBS= THE NUMBER OF OBSERVATIONS AND	* PRED 120
C *	BANDS IS A VECTOR OF PERIOD VALUES IN THE SPECTRUM.	* PRED 130
C *		* PRED 140
C *	MATRIX X IS STORED IN VECTOR MODE. SEE IBM SYSTEM/360 SUB-	* PRED 150
C *	ROUTINE PACKAGE (360A-CM-03X) VERSION III, PROGRAMMER'S MANUAL,	* PRED 160
C *	PUBLICATION NUMMER H20-0205-3, PAGES 3-6. ESSENTIALLY EACH COL-	* PRED 170
C *	UMN OF MATRIX X IS STRUNG END-TO-END INTO ONE LONG VECTOR.	* PRED 180
C *		* PRED 190
C *	THE FIRST NOBS VALUES OF VECTOR (MATRIX) X WILL BE THE DEPENDENT	* PRED 200
C *	VARIABLE (SEE SUBROUTINE DEPVAR). THE NEXT NOBS POINTS (COLUMN	* PRED 210
C *	TWO) WILL CONTAIN COS WAVE, BAND 1, THE NEXT NOBS POINTS (COLUMN	* PRED 220
C *	THREE CONTAINS SIN WAVE, BAND 1, ETC.	* PRED 230
C *		* PRED 240
C	*****	PRED 250
C		PRED 260
C	C-CONVERT TO RADIANS/OBSERVATION AND LOOP THRU NBANDS TIMES.	PRED 270
C		PRED 280
	L=NOBS	PRED 290
	DO 10 LBAND=1,NBANDS	PRED 300
	AFREQ=6.28318/BANDS(LBAND)	PRED 310
	EF=-AFREQ	PRED 320
	DO 20 LOBS=1,NOBS	PRED 330
	L=L+1	PRED 340
	EF=EF+AFREQ	PRED 350
20	X(L)=COS(EF)	PRED 360
	EF=-AFREQ	PRED 370
	DO 10 LOBS=1,NOBS	PRED 380
	L=L+1	PRED 390
	EF=EF+AFREQ	PRED 400
10	X(L)=SIN(EF)	PRED 410
C		PRED 420
C	C-X CONTAINS THE VECTORS OF SIN/COS WAVES STRUNG END-TO-END. THIS IS	PRED 430
C	EQUIVALENT TO A MATRIX WHERE EACH SIN OR COS WAVE FORMS A COLUMN OF	PRED 440
C	C-NOBS LENGTH.	PRED 450
C		PRED 460
	RETURN	PRED 470
	END	PRED 480

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C		DEPV	10
C		DEPV	20
	SUBROUTINE DEPVAR(X,NOBS,JDATA,JDOMAN,JPRINT)	DEPV	30
	DIMENSION X(1)	DEPV	40
	COMMON KREADR	DEPV	50
C		DEPV	60
C	*****	DEPV	70
C	*	* DEP	80
C	* SUBROUTINE D E P V A R	DEPV	90
C	*	* DEP	100
C	* DEPVAR EITHER READS IN OR GENERATES (VIA SIMULA), A DEPENDENT	* DEP	110
C	* VARIABLE VECTOR OF LENGTH NOBS. THE DEPENDENT VARIABLE IS STORED*	DEPV	120
C	* INTO THE FIRST NOBS CELLS OF X, A MATRIX OF VARIABLES STORED AS A*	DEPV	130
C	* VECTOR OF COLUMNS. SEE SUBROUTINE PREGEN FOR REST OF X.	* DEP	140
C	*	* DEP	150
C	*****	DEPV	160
C		DEPV	170
C	C-IF JDATA IS 0 - READ FROM CARDS. (10X,7F10.0)	DEPV	180
C	C-IF JDATA IS 1 - CALL SIMULA WHICH GENERATES DATA USING A MONTE CARLO	DEPV	190
C	C-SYSTEM ALONG WITH DETERMINISTIC DATA. SIMULA READS CARDS.	DEPV	200
C		DEPV	210
	IF (JDATA) 10,10,50	DEPV	220
	10 READ (KREADR,1) (X(L),L=1,NOBS)	DEPV	230
	1 FORMAT (10X,7F10.0)	DEPV	240
	GO TO 20	DEPV	250
	50 CALL SIMULA(X,NOBS,JDATA,JDOMAN,JPRINT)	DEPV	260
	20 RETURN	DEPV	270
	END	DEPV	280

C		SIML 10
C		SIML 20
	SUBROUTINE SIMULA(X,N,J,JDDMAN,JPRINT)	SIML 30
	DIMENSION X(1),A(130),BAND(1)	SIML 40
	COMMON KREADR,KPRINT	SIML 50
C		SIML 60
C	*****	SIML 70
C *		* SIML 80
C *	SUBROUTINE S I M U L A	* SIML 90
C *		* SIML 100
C *	SIMULA IS A PRIMITIVE MONTE CARLO AND SIGNAL GENERATOR FOR CREAT--	* SIML 110
C *	ING ARTIFICIAL DATA. GAUSSIAN DATA ARE READ IN FROM CARDS AND	* SIML 120
C *	A NUMBER OF SINE WAVES OF VARIABLE FREQUENCY AND AMPLITUDE ARE	* SIML 130
C *	ADDED.	* SIML 140
C *		* SIML 150
C	*****	SIML 160
C		SIML 170
C	C-ZERO VECTOR X AND PRINT HEADING	SIML 180
C		SIML 190
	DO 100 L=1,N	SIML 200
	100 X(L)=0.0	SIML 210
	IF (JPRINT) 110,110,120	SIML 220
	120 WRITE (KPRINT,121)	SIML 230
	121 FORMAT('IM D N T E C A R L O SIMULATED DATA',/, '0')	SIML 240
C		SIML 250
C	C-READ IN MODEL SPECIFICATIONS - GENERATE SINES AND ADD NOISE	SIML 260
C	NSIN-NUMBER OF SINE WAVES IN DATA	SIML 270
C	BAND-FREQ. OR PERIOD OF THE LSINTH SINE WAVE	SIML 280
C	SD-STANDARD DEVIATION OF THE LSINTH SINE WAVE. (AMPLITUDE)	SIML 290
C	SON-STANDARD DEV. OF GAUSSIAN NOISE	SIML 300
C		SIML 310
	110 READ (KREADR,1) NSIN	SIML 320
	1 FORMAT (15)	SIML 330
	DO 10 LSIN=1,NSIN	SIML 340
	READ (KREADR,2) BAND(1),SD	SIML 350
	2 FORMAT (2F10.0)	SIML 360
	IF (JDDMAN)20,20,30	SIML 370
30	BAN=BAND(1)	SIML 380
	BAND(1)=1.0/BAND(1)	SIML 390
	GO TO 21	SIML 400
20	BAN=1.0/BAND(1)	SIML 410
21	IF (JPRINT) 25,25,22	SIML 420
22	WRITE (KPRINT,3) LSIN, BAND(1), BAN,SD	SIML 430
	3 FORMAT(' BAND',13,' - PERIOD=',F10.4,' , FREQUENCY=',F10.4,' , AMPLITUDE=',F10.4)	SIML 440
	25 AFREQ=6.28318/BAND(1)	SIML 450
	EF=-AFREQ	SIML 460
	DO 26 L=1,N	SIML 470
	EF=EF+AFREQ	SIML 480
26	A(L)=SIN(EF)*1.41421	SIML 490
	DO 10 L=1,N	SIML 500
	10 X(L)=X(L)+A(L)*SD	SIML 510
C		SIML 520
C	C-READ IN NOISE SD AND NOISE CARDS	SIML 530
		SIML 540

C

READ (KREADR,2) SDN	SIML 550
IF(SDN) 1000,1000,40	SIML 560
40 IF (JPRINT) 50,50,41	SIML 570
41 WRITE (KPRINT,5) SDN	SIML 580
5 FORMAT('RANDOM GAUSSIAN NOISE AMPLITUDE=',F10.4)	SIML 590
50 READ (KREADR,6) (A(L),L=1,N)	SIML 600
6 FORMAT(4X,10F6.4)	SIML 610
DO 60 L=1,N	SIML 620
60 X(L)=A(L)*SDN+X(L)	SIML 630
1000 RETURN	SIML 640
END	SIML 650
	SIML 660

C		MATP	10
C		MATP	20
	SUBROUTINE MATPRT(R,M,LVAR)	MATP	30
	DIMENSION R(1),X(15),LVAR(1)	MATP	40
	COMMON KREADR, KPRINT	MATP	50
C		MATP	60
C	*****	MATP	70
C	*	* MATP	80
C	* SUBROUTINE M A T P R T	* MATP	90
C	*	* MATP	100
C	* MATPRT PRINTS OUT THE LOWER TRIANGULAR MATRIX X WHERE X IS STOR-	* MATP	110
C	* ED IN MODE 1. SEE REFERENCE LISTED IN SUBROUTINE PREGEN.	* MATP	120
C	*	* MATP	130
C	*****	MATP	140
C		MATP	150
C	C-LOOP THRU AS MANY TIMES AS NEEDED TO PRINT WHOLE MATRIX, EACH TIME	MATP	160
C	C-PRINTING 15 COLUMNS BY NRO ROWS.	MATP	170
C		MATP	180
	N1=1	MATP	190
	N2=15	MATP	200
110	IF (N2-M) 100,100,10	MATP	210
10	N2=M	MATP	220
100	WRITE (KPRINT,1) (LVAR(LV),LV=N1,N2)	MATP	230
	1 FORMAT('0',2X,15I7)	MATP	240
	WRITE (KPRINT,2)	MATP	250
	2 FORMAT('0')	MATP	260
C		MATP	270
C	C-PRINT ONE ROW AT A TIME. MATRIX R IS MODE 1, UPPER TRIANGULAR.	MATP	280
C	C-THEREFORE REVERSE SUBSCRIPTS TO MAKE LOWER TRIANGULAR.	MATP	290
C		MATP	300
	DO 20 LROW=N1,M	MATP	310
	IF (LROW-N2) 21,21,22	MATP	320
21	LIMIT=LROW	MATP	330
	GO TO 23	MATP	340
22	LIMIT=N2	MATP	350
23	L=0	MATP	360
	DO 30 LCOL=N1,LIMIT	MATP	370
	L=L+1	MATP	380
	CALL LOC(LCOL,LROW,K,M,M,1)	MATP	390
30	X(L)=R(K)	MATP	400
20	WRITE (KPRINT,3) (LROW,(X(K),K=1,L))	MATP	410
	3 FORMAT(1X,13,2X,15F7.3)	MATP	420
	N1=N1+15	MATP	430
	N2=N1+14	MATP	440
	IF (M-N1) 1000,110,110	MATP	450
1000	RETURN	MATP	460
	END	MATP	470

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C		USPT 10
C		USPT 20
	SUBROUTINE USPECT(R,T,N ,M,B,NBANDS,STD,JPRINT,JPLOT,PHASE,BAN,	USPT 30
	1 BANDS,AMNAME,TNAME,PHNAME,XNAME,JDOMAN,BANAME)	USPT 40
	DIMENSION R(1),T(1),B(1),STD(1),PHASE(1),BAN(1),BANDS(1),AMNAME(1)	USPT 50
	1,TNAME(1),PHNAME(1),XNAME(1),BANAME(1)	USPT 60
	COMMON KREADR,KPRINT	USPT 70
C		USPT 80
C	*****	USPT 90
C	*	* USPT 100
C	SUBROUTINE U S P E C T	USPT 110
C	*	* USPT 120
C	* USPECT COMPUTES THE UNIVARIATE SPECTRUM BY MULTIPLYING THE CORR-	* USPT 130
C	* ELATION OF THE TIME SERIES WITH A SIN OR COS PREDICTOR BY THE	* USPT 140
C	* RATIO OF STANDARD DEVIATIONS OF THE TWO. THIS IS DONE FOR EACH	* USPT 150
C	* PREDICTOR. LET R=THE CORRELATION OF F(T) WITH A SIN OR COS WAVE	* USPT 160
C	* OF SOME ARBITRARY WAVE LENGTH. LET S =THE STANDARD DEVIATION	* USPT 170
C	* OF THE TIME SERIES AND .707=THE STANDARD DEVIATION OF THE PRED-	* USPT 180
C	* ICTOR WAVE. THEN A(F) = R*(S/.707)	* USPT 190
C	* WHERE A(F)=THE AMPLITUDE OF THE COMPLEX SPECTRUM AT F. THE SIN	* USPT 200
C	* AND COS COMPONENTS ARE COMBINED AT EACH WAVE LENGTH AND PHASE	* USPT 210
C	* ANGLE IS COMPUTED. T-VALUES ARE ALSO COMPUTED FOR EACH BAND.	* USPT 220
C	* R=UPPER TRIANGULAR CORRELATION MATRIX, IN STORAGE MODE 1. SEE	* USPT 230
C	* IBM PUBLICATION REFERENCED IN SUBROUTINE PREGEN. (INPUT)	* USPT 240
C	* T=VECTOR OF T-VALUES. (OUTPUT)	* USPT 250
C	* NORBS=NUMBER OF OBSERVATIONS. (INPUT)	* USPT 260
C	* M=TOTAL NUMBER OF DATA VECTORS. M=NBANDS*2 + 1. ONE VECTOR FOR	* USPT 270
C	* THE DEPENDENT VARIABLE AND TWO FOR THE SIN/COS WAVES AT EACH WAVE	* USPT 280
C	* LENGTH. (INPUT). B=VECTOR OF SPECTRUM ESTIMATES. (OUTPUT)	* USPT 290
C	* NBANDS=LENGTH OF VECTORS T,B AND PHASE. (INPUT)	* USPT 300
C	* STD=STANDARD DEVIATIONS OF ALL VARIABLES. (INPUT)	* USPT 310
C	* JPRINT=PRINT CONTROL - SEE MAINLINE. (INPUT)	* USPT 320
C	* JPLOT=PLOT CONTROL - SEE MAINLINE. (INPUT)	* USPT 330
C	* PHASE=VECTOR OF PHASE ANGLES. (OUTPUT)	* USPT 340
C	*	* USPT 350
C	*****	USPT 360
	LBAND=0	USPT 370
C		USPT 380
	C-EXTRACT VECTOR OF CORRELATIONS BETWEEN DEPENDENT VARIABLE AND EACH	USPT 390
	C-PREDICTOR VARIABLE.	USPT 400
C		USPT 410
	DO 10 L=2,M	USPT 420
	CALL LOC(1,L,KOOL,M,M,1)	USPT 430
	10 B(L)=R(KOOL)	USPT 440
C		USPT 450
	C-LOOP THRU THE SPECTRUM COMPUTATION NBAND TIMES.	USPT 460
C		USPT 470
	FACT=SQRT(FLOAT(N-2))	USPT 480
	DO 20 L=2,M,2	USPT 490
	K=L+1	USPT 500
	LRAND=LBAND+1	USPT 510
C		USPT 520
	C-CO=COS COMPONENT OF SPECTRUM ESTIMATE	USPT 530
	C-SI=SIN COMPONENT OF SPECTRUM ESTIMATE	USPT 540

C-TC=T-VALUE FOR COS COMPONENT	USPT 550
C-TS=T-VALUE FOR SIN COMPONENT	USPT 560
C	USPT 570
CO=B(L)*STD(1)/.707	USPT 580
SI=B(K)*STD(1)/.707	USPT 590
TC=B(L)*FACT/SQRT(1.0-B(L)**2)	USPT 600
TS=B(K)*FACT/SQRT(1.0-B(K)**2)	USPT 610
C	USPT 620
C-COMPUTE SPECTRUM AMPLITUDE, T-VALUE AND PHASE ANGLE	USPT 630
C	USPT 640
B(LBAND)=SQRT(CO**2 + SI**2)	USPT 650
T(LBAND)=SQRT(TC**2 + TS**2)	USPT 660
20 PHASE(LBAND)=ATAN(CO/SI)	USPT 670
C	USPT 680
C-PRINT AND/OR PLOT IF DESIRED	USPT 690
C	USPT 700
JPR=JPRINT-1	USPT 740
JPL=JPLOT-1	USPT 750
IF (JPR) 50,50,60	USPT 760
50 IF (JPL) 1000,1000,60	USPT 770
60 WRITE(KPRINT,1)	USPT 780
1 FORMAT('O S I N G L E B A N D S P E C T R U M')	USPT 790
CALL OUTPUT(BANDS,BAN,B,T,PHASE,NBANDS,AMNAME,TNAME,PHNAME	USPT 800
1,BANAME,XNAME,JPRINT,JPLOT,JDOMAN)	USPT 810
1000 RETURN	USPT 820
END	USPT 830

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C		PPIK	10
C		PPIK	20
	SUBROUTINE PPIKR(B,T,ISAVE,NPEAK,NBANDS,SIGLEV)	PPIK	30
	DIMENSION B(1),T(1),ISAVE(1)	PPIK	40
C		PPIK	50
C	*****	PPIK	60
C *		* PPIK	70
C *	SUBROUTINE P P I K R	* PPIK	80
C *		* PPIK	90
C *	PPIKR RETURNS THE VECTOR INDEX OF ALL SIGNIFICANT SPECTRUM PEAKS.	* PPIK	100
C *	B-INPUT VECTOR OF AMPLITUDE SPECTRUM ESTIMATES	* PPIK	110
C *	T-INPUT VECTOR OF T-VALUES FOR EACH SPECTRUM ESTIMATE	* PPIK	120
C *	ISAVE-OUTPUT VECTOR OF INDEX NUMBERS OF SIGNIFICANT PEAKS	* PPIK	130
C *	NPEAK-OUTPUT SCALAR - NUMBER OF PEAKS FOUND	* PPIK	140
C *	NBANDS-INPUT SCALAR - NUMBER OF BANDS IN SPECTRUM	* PPIK	150
C *	SIGLEV-INPUT SCALAR - CRITERION WHICH T-VALUE FOR A PEAK MUST	* PPIK	160
C *	EXCEED IN ORDER TO BE RETAINED	* PPIK	170
C *		* PPIK	180
C	*****	PPIK	190
C		PPIK	200
C	C-SEARCH FOR PEAKS, RETAIN 'SIGNIFICANT' ONES, BUILD ISAVE.	PPIK	210
C		PPIK	220
	NPEAK=0	PPIK	230
	DO 10 L=2,NBANDS	PPIK	240
	IF (B(L-1)-B(L)) 20,10,10	PPIK	250
	20 IF (T(L+1)-B(L)) 40,10,10	PPIK	260
	40 IF (T(L)-SIGLEV) 10,50,50	PPIK	270
	50 NPEAK=NPEAK+1	PPIK	280
	ISAVE(NPEAK)=L	PPIK	290
	10 CONTINUE	PPIK	300
	RETURN	PPIK	310
	END	PPIK	320

C		CRIT 10
C		CRIT 20
	FUNCTION CRIT(RSQ,T,JCRITR,L)	CRIT 30
	DIMENSION T(1)	CRIT 40
C		CRIT 50
C	*****	CRIT 60
C *		* CRIT 70
C *	FUNCTION C R I T R	* CRIT 80
C *		* CRIT 90
C *	CRITR SELECTS A CRITERION FOR THE SPECTRUM OPTIMIZATION BY PEAK	* CRIT 100
C *	SHIFTING. SELECTS EITHER R-SQUARE OR THE APPROPRIATE T VALUE.	* CRIT 110
C *		* CRIT 120
C	*****	CRIT 130
C		CRIT 140
C	SELECT APPROPRIATE VALUE FOR CRITERION.	CRIT 150
C	RSQ-INPUT SCALAR - VALUE OF R-SQUARE	CRIT 160
C	T-INPUT VECTOR - T-VALUES	CRIT 170
C	JCRITR-CONTROL DIGIT FOR SELECTION OF EITHER RSQ OR T(L) AS CRITERION	CRIT 180
C	0=RSQ AS CRITERION	CRIT 190
C	1=T-VALUE AS CRITERION	CRIT 200
C	L-INDEX VALUE OF VECTOR T	CRIT 210
C		CRIT 220
	IF (JCRITR) 10,10,20	CRIT 230
10	CRITR=RSQ	CRIT 240
	GO TO 30	CRIT 250
20	CRITR=T(L)	CRIT 260
30	RETURN	CRIT 270
	END	CRIT 280

C		KSPT 10
C		KSPT 20
	SUBROUTINE <SPECT(R,T,N,M,NPEAK,ISAV ,RX,B,JPRINT,XBAR,STD,D,RSQ,	KSPT 30
	1PHASE, BANDS,BAN)	KSPT 40
	DIMENSION ISAVE(100) ,R(1),T(1),RX(1),B(1),XBAR(1),STD(1),D(1),	KSPT 50
	1PHASE(1),BANDS(1),BAN(1) ,ANS(10),ISAV(1),RY(100)	KSPT 60
	COMMON KREADR,KPRINT	KSPT 70
	C-CONVERT ISAV TO ISAVE, FROM FREQ BAND VECTOR TO VECTOR OF SIN/COS PAIR	KSPT 80
C		KSPT 90
	98521 FORMAT ('OJKL=',I5)	KSPT 100
	K=0	KSPT 110
	DO 100 L=1,NPEAK	KSPT 120
	K=K+1	KSPT 130
	ISAVE(K)=ISAV(L)*2	KSPT 140
	K=K+1	KSPT 150
	100 ISAVE(K)=ISAVE(K-1)+1	KSPT 160
C		KSPT 170
	C-SELECT SUB-MATRIX OF PREDICTORS ETC FROM R, ACCORDING TO ISAVE.	KSPT 180
C		KSPT 190
	CALL ORDER(M,R,1,K ,ISAVE,RX,RY)	KSPT 200
C		KSPT 210
	C-INVERT K-ORDER MATRIX OF PREDICTOR INTERCORRELATIONS, RX	KSPT 220
C		KSPT 230
	CALL MINV(RX,K,DET,B,T)	KSPT 240
	IF (JPRINT-3) 300,400,400	KSPT 250
	400 WRITE (KPRINT,7) DET	KSPT 260
	7 FORMAT('O',/, 'O DETERMINANT =',E30.15)	KSPT 270
C		KSPT 280
	C-COMPUTE REGRESSIONS(SPECTRUM) FOR NPEAK SIZED MODEL.	KSPT 290
C		KSPT 300
	300 CALL MULTRIN,K,XBAR,STD,D,RX,RY,ISAVE,B,SB,T,ANS)	KSPT 310
	RSQ=ANS(2)**2	KSPT 320
C		KSPT 330
	C-CONVERT SPECTRUM TO AMPLITUDES BY COMBINING SIN/COS. PUT INTO D.	KSPT 340
	C-ALSO CONVERT T.	KSPT 350
C		KSPT 360
	NFREQ=0	KSPT 370
	DO 200 L=1,K,2	KSPT 380
	NFREQ=NFREQ+1	KSPT 390
	PHASE(NFREQ)=ATAN(B(L)/B(L+1))	KSPT 400
	B(NFREQ)=SQRT(B(L)**2 + B(L+1)**2)	KSPT 410
	200 T(NFREQ)=SQRT(T(L)**2 + T(L+1)**2)	KSPT 420
	10 RETURN	KSPT 430
	END	KSPT 440

C		MULT	10
C		MULT	20
	SUBROUTINE MULTIIISAVE,NPEAK,NBANDS,R,T,N,M,RX,B,XBAR,STD,D,RSQ,	MULT	30
	I PHASE,BANDS,BAN)	MULT	40
	DIMENSION ISAVE(1),R(1),T(1),RX(1),B(1),XBAR(1),STD(1),D(1),PHASE	MULT	50
	I (1),BANDS(1),BAN(1),KSAVE(20),S(20),TSPEC(20),TPH(20)	MULT	60
	COMMON KREADR,KPRINT	MULT	70
C		MULT	80
C	*****	MULT	90
C	*	* MULT	100
C	SUBROUTINE M U L T I	* MULT	110
C	*	* MULT	120
C	MULTI COMPUTES THE FULL SPECTRUM OF A TIME SERIES USING A K+1	* MULT	130
C	BANDS MODEL WHERE K=THE NUMBER OF PEAKS IN THE OPTOMIZED	* MULT	140
C	MODEL. THE EXTRA BAND IS THE WAVELENGTH IN QUESTION, THE OTHERS	* MULT	150
C	ARE THE SIGNIFICANT PEAKS. THE VARIANCE ACCOUNTED FOR BY	* MULT	160
C	THE SIGNIFICANT PEAKS IS THUS 'ACCOUNTED FOR' IN EACH ESTIMATE.	* MULT	170
C	WHEN THE CURRENT BAND IS ONE OF THE SIGNIFICANT PEAKS, A SKIP	* MULT	180
C	OCCURS. VARIABLES DEFINED IN MAINLINE.	* MULT	190
C	*	* MULT	200
C	*****	MULT	210
C		MULT	220
C		MULT	230
	C-LOOP THRU ONCE FOR EACH FREQ BAND. NFMOD IS THE NUMBER OF SIGNIFIC-	MULT	240
	C-CANT PEAKS IN MODEL PLUS A CURRENT BAND.	MULT	250
C		MULT	260
	NFMOD=NPEAK+1	MULT	270
	DO 310 LF=1,NBANDS	MULT	280
C		MULT	290
	C-CONSTRUCT NEW ISAVE VECTOR	MULT	300
C		MULT	310
	CALL BUILD(KSAVE,ISAVE,LF,NFMOD,ISKIP,NPEAK)	MULT	320
C		MULT	330
	C-SKIP IF THIS BAND IS IN THE MODEL ALREADY	MULT	340
C		MULT	350
	IF (ISKIP) 320,320,330	MULT	360
C		MULT	370
	C-BRANCH TO 330 IMPLIES THAT THE CURRENT BAND IS ONE OF THE SIGNIFICANT	MULT	380
	C-PEAKS. DO AN NPEAK SPECTRUM AND PICK OUT CURRENT BAND.	MULT	390
C		MULT	400
	330 CALLKSPECT(R,S,N,M,NPEAK,ISAVE,RX,TSPEC,D,XBAR,STD,D,RSQ,TPH,	MULT	410
	LBANDS,BAN)	MULT	420
C		MULT	430
	C-TSPEC CONTAINS ALL MODEL ESTIMATES. PICK THE ONE FOR LF.	MULT	440
C		MULT	450
	DO 331 LLZ=1,NPEAK	MULT	460
	IF (LF-ISAVE(LLZ)) 331,333,331	MULT	470
	333 B(LF)=TSPEC(LLZ)	MULT	480
	PHASE (LF)=TPH(LLZ)	MULT	490
	T(LF)=S(LLZ)	MULT	500
	331 CONTINUE	MULT	510
	GO TO 310	MULT	520
C		MULT	530
	C-BRANCH TO 320 IMPLIES THAT THIS IS A FULL NFMOD MODEL. DO SPECTRUM	MULT	540

C-AND PICK OUT CURRENT BAND.

MULT 550

C

MULT 560

320 CALLKSPECTIR,S,N,H,NFMOD,KSAVE,RX,TSPEC,O,XBAR,STD,D,RSQ,TPH,

MULT 570

1 BANDS,BAN)

MULT 580

DO 321 LLL=1,NFMOD

MULT 590

IF(LF-KSAVE(LLL)) 321,322,321

MULT 600

322 T(LF)=S(LLL)

MULT 610

B(LF)=TSPEC(LLL)

MULT 620

PHASE (LF)=TPH(LLL)

MULT 630

321 CONTINUE

MULT 640

310 CONTINUE

MULT 650

RETURN

MULT 660

END

MULT 670

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C		BILD 10
C		BILD 20
	SUBROUTINE BUILD(KSAVE,ISAVE,LF,NFMODE,ISKIP,NPEAK)	BILD 30
	DIMENSION KSAVE(1),ISAVE(1),ASAVE(30),RANC(30)	BILD 40
C		BILD 50
C	*****	BILD 60
C	*	* BILD 70
C	SUBROUTINE BUILD	BILD 80
C	* BUILD CONSTRUCTS VECTOR OF RANKED FREQ BAND NUMBERS GIVEN A	* BILD 90
C	* PARTICULAR MODEL AND A CURRENT FREQUENCY.	* BILD 100
C	* KSAVE - OUTPUT VECTOR TO BE BUILT	* BILD 110
C	* ISAVE - INPUT VECTOR CONTAINING NFREQ SIGNIF PEAKS	* BILD 120
C	* LF - INPUT SCALAR - NEW FREQ BAND TO BE ADDED (CURRENT ONE)	* BILD 130
C	* NFMODE - INPUT - NUMBER OF FREQ BANDS IN NEW MODEL	* BILD 140
C	* ISKIP - OUTPUT CONTROL DIGIT TO KEEP FROM COMPUTING ESTIMATE	* BILD 150
C	* OF ONE OF THE OLD PEAKS AGAIN	* BILD 160
C	* NPEAK - INPUT - NUMBER OF FREQ BANDS IN OLD MODEL	* BILD 170
C	*	* BILD 180
C	*****	BILD 190
C		BILD 200
C	C-SEE IF LF IS ALREADY IN MODEL	BILD 210
C		BILD 220
	DO 10 L=1,NPEAK	BILD 230
	IF(LF - ISAVE(L)) 10,99,10	BILD 240
	10 CONTINUE	BILD 250
C		BILD 260
C	C-STORE VECTOR OF ISAVE PLUS LF INTO ASAVE AND RANK IT. RANK STORED IN	BILD 270
C	C-VECTOR RANC	BILD 280
C		BILD 290
	DO 20 L=1,NPEAK	BILD 300
	20 ASAVE(L)=ISAVE(L)	BILD 310
	ASAVE(NFMODE)=LF	BILD 320
	CALL RANK(ASAVE,RANC,NFMODE)	BILD 330
C		BILD 340
C	C-BUILD KSAVE OF RANKED FREQ BANDS	BILD 350
C		BILD 360
	DO 30 L=1,NFMODE	BILD 370
	KOOL=RANC(L)	BILD 380
	30 KSAVE(KOOL)=ASAVE(L)	BILD 390
	ISKIP=0	BILD 400
	GO TO 100	BILD 410
	99 ISKIP=1	BILD 420
	100 RETURN	BILD 430
	END	BILD 440

C		OUTP 10
C		OUTP 20
	SUBROUTINE OUTPUT(BANDS,BAN,B,T,PHASE,NBANDS,AMNAME,TNAME,PHNAME,	OUTP 30
	1BANAME,XNAME,JPRINT,JPLOT,JDOMAN)	OUTP 40
	DIMENSION BANDS(1),BAN(1),B(1),T(1),PHASE(1),AMNAME(1),TNAME(1),	OUTP 50
	1PHNAME(1),BANAME(1),XNAME(1)	OUTP 60
	COMMON KREADR,KPRINT	OUTP 70
C		OUTP 80
C	*****	OUTP 90
C	*	* OUTP 100
C	* SUBROUTINE O U T P U T	* OUTP 110
C	*	* OUTP 120
C	* OUTPUT PRINTS AND/OR PLOTS SPECTRA WITH DOCUMENTATION.	* OUTP 130
C	*	* OUTP 140
C	*****	OUTP 150
C		OUTP 160
C	C-PRINT OUT DOCUMENTATION AND VECTOR ORDER IN APPROPRIATE DOMAIN)	OUTP 170
C	C-FIND SCALE VALUES AND PLOT	OUTP 180
C		OUTP 190
	TOPI=6.28318	OUTP 200
	BTOPI=-TOPI	OUTP 210
	BMAX=B(1)	OUTP 220
	DO 64 LBAND=2,NBANDS	OUTP 230
	IF (BMAX-B(LBAND)) 68,64,64	OUTP 240
68	BMAX=B(LBAND)	OUTP 250
64	CONTINUE	OUTP 260
	TMAX=T(1)	OUTP 270
	DO 66 LBAND=2,NBANDS	OUTP 280
	IF (TMAX-T(LBAND)) 67,66,66	OUTP 290
67	TMAX=T(LBAND)	OUTP 300
66	CONTINUE	OUTP 310
	IF (JDOMAN) 60,60,50	OUTP 320
C		OUTP 330
C	C-REVERSE VECTORS IF FREQ DOMAIN IS USED - PRINT - REVERSE AGAIN.	OUTP 340
C		OUTP 350
50	CALL REV(B,NBANDS)	OUTP 360
	CALL REV(T,NBANDS)	OUTP 370
	CALL REV(PHASE,NBANDS)	OUTP 380
	IF (JPRINT) 52,52,51	OUTP 390
51	WRITE (KPRINT,2)	OUTP 400
2	FORMAT('OF FREQUENCY ',5X,'AMPLITUDE',5X,'T-VALUE',8X,'PHASE',/, '0')	OUTP 410
	DO 55 LBAND=1,NBANDS	OUTP 420
55	WRITE (KPRINT,3) BAN(LBAND),B(LBAND),T(LBAND),PHASE(LBAND)	OUTP 430
3	FORMAT(F10.3,5X,F9.3,5X,F7.3,5X,F8.3)	OUTP 440
52	IF (JPLOT) 54,54,53	OUTP 450
53	CALL PLOT2(B,BMAX,0.0,T,TMAX,0.0,NBANDS,BAN,AMNAME,TNAME,BANAME)	OUTP 460
	CALL PLOT2(PHASE,TOPI,BTOPI,T,TMAX,0.0,NBANDS,BAN,PHNAME,TNAME,	OUTP 470
	1 BANAME)	OUTP 480
54	CALL REV(B,NBANDS)	OUTP 490
	CALL REV(T,NBANDS)	OUTP 500
	CALL REV(PHASE,NBANDS)	OUTP 510
	GO TO 100	OUTP 520
60	IF (JPRINT) 62,62,61	OUTP 530
61	WRITE (KPRINT,4)	OUTP 540

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4	FORMAT('PERIOD',5X,'AMPLITUDE',5X,'T-VALUE',8X,'PHASE',/, '0')	OUTP 550
DO 65	LBAND=1,NBANDS	OUTP 560
65	WRITE (KPRINT,3) BANDS(LBAND),B(LBAND),T(LBAND),PHASE(LBAND)	OUTP 570
62	IF (JPLOT) 100,100,63	OUTP 580
63	CALL PLOT2(B,BMAX,0.0,T,TMAX,0.0,NBANDS,BANDS,AMNAME,TNAME,XNAME)	OUTP 590
	CALL PLOT2(PHASE,TOPI,BTOPI,T,TMAX,0.0,NBANDS,BANDS,PHNAME,TNAME,	OUTP 600
	1 XNAME)	OUTP 610
100	RETURN	OUTP 620
	END	OUTP 630

C		PLT2 10
C		PLT2 20
	SUBROUTINE PLOT2(Y1,YMAX1,YMIN1,Y2,YMAX2,YMIN2,NP,XAX,YNAM1,	PLT2 30
	1 YNAM2,XNAM)	PLT2 40
	DIMENSION Y1(1),Y2(1),LINE(111),XAX(1),XNAM(5),YNAM1(9),YNAM2(9)	PLT2 50
	COMMON KREADR,KPRNT	PLT2 60
	DATA KBLNK/' ',KBORD/'.',KAL/'+'/,KPLOT/'*'/	PLT2 70
C		PLT2 80
	C--PLOT2 GENERATES TWO OVER/UNDER GRAPHS PER PAGE AND CALIBRATES	PLT2 90
	C--THEM. Y1=VERTICAL VARIABLE 1, YMAX1, YMIN1=VERTICAL PLOT LIMITS.	PLT2 100
	C--Y2, YMAX2, YMIN2=SIMILAR FOR SECON VARIABLE, NP=NUMBER OF POINTS.	PLT2 110
	C--XAX=X AXIS (COMMON TO BOTH VARIABLES).	PLT2 120
	WRITE (KPRNT,2) YNAM1,YNAM2,XNAM	PLT2 130
	2 FORMAT('1' / T5,'*'/ T5,'*',T25,'*',T80,'*'/ T5,'*',T25,'****'	PLT2 140
	1,T80,'****'/ T3,'*****',T18,'*****',,9A4,T73,'*****' 'PLT2 150	
	2,9A4/T4,'****',T25, '****', T80,'****'/T5,'*',T25,'*',T80,'*'/1X,5A4)	PLT2 160
		PLT2 170
C		PLT2 180
	C--GENERATE SCALE FACTORS	PLT2 190
	SKAL1=50.5/(YMAX1-YMIN1)	PLT2 200
	SKAL2=50.5/(YMAX2-YMIN2)	PLT2 210
	C--GENERATE CALIBRATION AND OUTPUT IT.	PLT2 220
	CAL01 = YMIN1	PLT2 230
	CAL02 = YMIN2	PLT2 240
	CAL1 = YMAX1	PLT2 250
	CAL2 = YMAX2	PLT2 260
	CAL51=YMAX1-(.5*(YMAX1-YMIN1))	PLT2 270
	CAL52=YMAX2-(.5*(YMAX2-YMIN2))	PLT2 280
	WRITE (KPRNT,1) CAL01,CAL51,CAL1,CAL02,CAL52,CAL2	PLT2 290
	1 FORMAT (' ',F14.4,F24.4,F23.4,F12.4,F23.4,F24.4)	PLT2 300
	C--GENERATE VERTICAL AXIS AND OUTPUT IT	PLT2 310
	DO 10 L = 1,111	PLT2 320
10	LINE(L) = KBORD	PLT2 330
	LINE(1) = KAL	PLT2 340
	LINE(26) = KAL	PLT2 350
	LINE(51) = KAL	PLT2 360
	LINE(61) = KAL	PLT2 370
	LINE(86) = KAL	PLT2 380
	LINE(111)= KAL	PLT2 390
	DO 20 L=52,60	PLT2 400
20	LINE(L) = KBLNK	PLT2 410
	WRITE(KPRNT,4) LINE	PLT2 420
	4 FORMAT(10X,111A1)	PLT2 430
C		PLT2 440
	C--DECIDE HOW MANY LINES BETWEEN POINTS	PLT2 450
	NWIDE = 32/NP	PLT2 460
C		PLT2 470
	C--LOOP FOR NUMBER OF POINTS, EACH TIME PLOTTING A POINT AND NWIDE SPACE	PLT2 480
	DO 30 LP = 1, NP	PLT2 490
C		PLT2 500
	C--CLEAR LINE AND GENERATE GRID POINTS	PLT2 510
	DO 40 L = 1,111	PLT2 520
40	LINE(L) = KBLNK	PLT2 530
	LINE(1)=KBORD	PLT2 540
	LINE(26)=KBORD	

LINE(51)=KBORD	PLT2 550
LINE(61)=KBORD	PLT2 560
LINE(86)=KBORD	PLT2 570
LINE(111)=KBORD	PLT2 580
C	PLT2 590
C--TEST FOR OVER OR UNDER RANGE AND TRUNCATE OUT-OF-BOUNDS VALUES	PLT2 600
IF (Y1(LP)-YMAX1) 2000, 2000, 2100	PLT2 610
2100 YA = YMAX1	PLT2 620
GO TO 5100	PLT2 630
2000 IF (Y1(LP)-YMIN1) 5000, 5200, 5200	PLT2 640
5000 YA = YMIN1	PLT2 650
GO TO 5100	PLT2 660
5200 YA=Y1(LP)	PLT2 670
5100 IF (Y2(LP)-YMAX2) 200, 200, 210	PLT2 680
210 YB = YMAX2	PLT2 690
GO TO 510	PLT2 700
200 IF (Y2(LP)-YMIN2) 500, 520, 520	PLT2 710
500 YB = YMIN2	PLT2 720
GO TO 510	PLT2 730
520 YB=Y2(LP)	PLT2 740
C	PLT2 750
C--NOW GENERATE POINT INDEXES	PLT2 760
510 K1 = (YA -YMIN1)*SKAL1+1.0	PLT2 770
K2 = (YB -YMIN2)*SKAL2+61.0	PLT2 780
LINE(K1)= KPL0T	PLT2 790
LINE(K2)= KPL0T	PLT2 800
C	PLT2 810
C--OUTPUT HORIZONTAL SCALE VALUE AND LINE	PLT2 820
WRITE (KPRNT ,3) XAX(LP),LINE	PLT2 830
3 FORMAT (1X,F 8.4,1X,111A1)	PLT2 840
C	PLT2 850
C--CLEAR LINE AND GENERATE BLANK LINES FOR SPACE	PLT2 860
IF (N(WIDE) 30,30,110	PLT2 870
110 DO 95 L=1,111	PLT2 880
95 LINE(L)=KBLNK	PLT2 890
LINE (1)=KBORD	PLT2 900
LINE(51)=KBORD	PLT2 910
LINE(26)=KBORD	PLT2 920
LINE(61)=KBORD	PLT2 930
LINE(86)=KBORD	PLT2 940
LINE(111)=KBORD	PLT2 950
C	PLT2 960
C--OUTPUT PLAIN LINE	PLT2 970
DO 90 LOOP=1,NWIDE	PLT2 980
90 WRITE (KPRNT,4) LINE	PLT2 990
30 CONTINUE	PLT21000
C	PLT21010
C--GENERATE RIGHT BORDER AND OUTPUT	PLT21020
DO 50 L = 1,111	PLT21030
50 LINE(L) = KBORD	PLT21040
LINE(1) = KAL	PLT21050
LINE(26) = KAL	PLT21060
LINE(51) = KAL	PLT21070
LINE(61) = KAL	PLT21080
LINE(86) = KAL	PLT21090
LINE(111)= KAL	PLT21100

DO 80 L= 52,60
80 LINE (L) = KBLNK
WRITE (KPRNT,4) LINE
RETURN
END

PLT21110
PLT21120
PLT21130
PLT21140
PLT21150

C		TOTM 10
C		TOTM 20
	SUBROUTINE TOTAM(X,N,NPEAK,ISAVE,M,PHASE,B,AMP)	TOTM 30
	DIMENSION X(1),ISAVE(1),PHASE(1),B(1)	TOTM 40
C		TOTM 50
C	*****	TOTM 60
C *		* TOTM 70
C *	SUBROUTINE T O T A M	* TOTM 80
C *		* TOTM 90
C *	TOTAM COMPUTES THE RESULTANT AMPLITUDE OF THE SUM OF NPEAK SIN-	* TOTM 100
C *	SOIDS WHICH HAVE THEIR AMPLITUDES AND PHASES DETERMINED BY THE	* TOTM 110
C *	CALLING PROGRAM.. TOTAM SIMPLY SELECTS THE APPROPRIATE SINE	* TOTM 120
C *	AND COSINE WAVES FROM X, WEIGHTS THEM, SUMS THEM AND THEN COM-	* TOTM 130
C *	PUTES THE AMPLITUDE OF THE SUM.	* TOTM 140
C *	W A R N I N G ----- THIS WILL DESTROY ROW 1 OF X WHICH	* TOTM 150
C *	CONTAINS THE ORIGINAL DEPENDENT VARIABLE.	* TOTM 160
C *		* TOTM 170
C	*****	TOTM 180
C		TOTM 190
C	C-LOOP THRU THE FOLLOWING NPEAK TIMES TO CREATE THE RESULTANT WAVE INX	TOTM 200
C		TOTM 210
	DO 100 LP=1,NPEAK	TOTM 220
	K=ISAVE(LP)	TOTM 230
	KC=K*2	TOTM 240
	KS=KC+1	TOTM 250
C		TOTM 260
C	C-THE FOLLOWING COMPUTES THE PROPER AMPLITUDES FOR THE COSINE AND SINE	TOTM 270
C	C-COMPONENTS, BASED ON PHASE AND AMPLITUDE ESTIMATES.	TOTM 280
C		TOTM 290
	PC=1.0	TOTM 300
	PC=PC/(TAN(PHASE(K))+ PC)	TOTM 310
	PS=PC*TAN(PHASE(K))	TOTM 320
C		TOTM 330
C	C-SELECT SINE AND COSINE VALUES FROM X A	TOTM 340
C	C-SELECT SINE AND COSINE VALUES FROM X, SUM AND PUT INTO X, ROW 1.	TOTM 350
C		TOTM 360
	DO 100 L=1,N	TOTM 370
	CALL LOC(KC,L,J,M,N,0)	TOTM 380
	CALL LOC(KS,L,I,M,N,0)	TOTM 390
	100 X(L)=X(J)*PC + X(I)*PS	TOTM 400
C		TOTM 410
C	C-COMPUTE AMPLITUDE OF RESULTANT	TOTM 420
C		TOTM 430
	SX=0.0	TOTM 440
	DO 10 L=1,N	TOTM 450
10	SX=SX+X(L)	TOTM 460
	SX=SX/FLOAT(N)	TOTM 470
	SXS=0.0	TOTM 480
	DO 20 L=1,N	TOTM 490
20	SXS=SXS+(X(L)-SX)**2	TOTM 500
	AMP=SQRT(SXS/FLOAT(N))	TOTM 510
	RETURN	TOTM 520
	END	TOTM 530

SUBROUTINE DATA
RETURN
END

NOTE: The following IBM Scientific Subroutines must
be included in the program:

CORRE, LOC, ORDER, MINV, MULTR, RANK

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C		SPT	10
C		SPT	20
C	*****	SPT	30
C	*****	SPT	40
C		SPT	50
C		SPT	60
	DIMENSION BANDS(50),BAN(50),PEAKS(50),PHASE(50),AMNAME(9),TNAME	SPT	70
	1(9),PHNAME(9),BANAME(5),XNAME(5),LVAR(100),ISAVE(100)	SPT	80
C		SPT	90
C	C-THE FOLLOWING DIMENSION MUST BE EQUAL TO OR GREATER THAN	SPT	100
C	C- NOBS*(NBANDS*2+1)	SPT	110
C		SPT	120
	DIMENSION X(30000)	SPT	130
C		SPT	140
C	C-THE FOLLOWING DIMENSIONS MUST BE EQUAL TO OR GREATER THAN NBANDS*2+1	SPT	150
C		SPT	160
	DIMENSION XBAR(100),STD(100),B(100),D(100),T(100)	SPT	170
C		SPT	180
C	C-THE FOLLOWING DIMENSION MUST BE EQUAL TO OR GREATER THAN	SPT	190
C	C- M*M, WHERE M=2*NBANDS+1	SPT	200
C		SPT	210
	DIMENSION RX(10000)	SPT	220
C		SPT	230
C	C-THE FOLLOWING DIMENSION MUST BE EQUAL TO OR GREATER THAN (M+1)*M/2	SPT	240
C		SPT	250
	DIMENSION R(5050)	SPT	260
	COMMON KREADR,KPRINT	SPT	270
	DATA AMNAME/'AMPL','ITUD','E ES','IMAT','E. ',' ',' ',' '	SPT	280
	1',' '	SPT	290
	DATA TNAME/'T-VA','LUE',' ',' ',' ',' ',' '	SPT	300
	1',' '	SPT	310
	DATA PHNAME/'PHAS','E ES','TIMA','TE. ',' ',' ',' '	SPT	320
	1',' '	SPT	330
	DATA BANAME/'FREQ','UENC','Y ',' '	SPT	340
	DATA XNAME/'PERI','OD ',' '	SPT	350
	KREADR=5	SPT	360
	KPRINT=6	SPT	370
C		SPT	380
C	C-READ IN CONTROL DIGITS AS FOLLOWS AND PRINT THEM OUT.	SPT	390
C	C JDOMAN-DOMAIN OF ANALYSIS. 0 OR BLANK=PERIOD, 1=FREQUENCY.	SPT	400
C	C JBANDS-HOW VECTOR OF FREQUENCY OR PERIOD BANDS WILL BE OBTAINED.	SPT	410
C	C 0 OR BLANK=GENERATE ACCORDING TO LIMITS SUBSEQUENTLY READ IN.	SPT	420
C	C 1=READ IN A VECTOR OF BANDS TO BE USED FROM CARDS.	SPT	430
C	C NBANDS-HOW MANY FREQUENCY OR PERIOD BANDS WILL BE USED.	SPT	440
C	C NOBS-THE NUMBER OF OBSERVATIONS IN THE DATA VECTOR	SPT	450
C	C JANALY-HOW THE DATA SHALL BE ANALYZED.	SPT	460
C	C 0 OR BLANK=DO UNIVARIATE SPECTRUM, SEARCH FOR BEST K-VARIATE	SPT	470
C	C MODEL	SPT	480
C	C 1=SIMPLY DO UNIVARIATE SPECTRUM	SPT	490
C	C 2=DO K-VARIATE SPECTRUM ACCORDING TO MODEL PARAMETER READ IN	SPT	500
C	C JDATA-TELLS SUBROUTINE DEPVAR WHERE TO GET DATA.	SPT	510
C	C 0 OR BLANK=READ FROM CARDS ACCORDING TO FORMAT (10X,7F10.0)	SPT	520
C	C 1=GENERATE DATA FROM MODELING PROGRAM CALLED BY DATA. THIS	SPT	530
C	C MODELING PROGRAM WILL ASK FOR MORE CARDS.	SPT	540

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C	JCRITR-SELECTS CRITERION FOR OPTIMIZATION OF K-VARIATE SPECTRUM.	SPT	550
C	0 OR BLANK=MULTIPLE R-SQUARED	SPT	560
C	1=T-VALUES	SPT	570
C	JPRINT-PRINTOUT CONTROL DIGIT	SPT	580
C	0=DONT PRINT ANY RESULTS	SPT	590
C	1=PRINT ONLY FINAL RESULTS	SPT	600
C	2=PRINT FINAL AND INTERMEDIATE RESULTS	SPT	610
C	3=PRINT AS FOR 2 PLUS MATRICES, CORRELATIONS, ETC FOR EACH STEP	SPT	620
C	JPLOT-PLOT CONTROL DIGIT. - VALUES AS ABOVE EXCEPT FOR 3.	SPT	630
C		SPT	640
	READ (KREADR,1) JDOAN,JBANDS,NBANDS,NOBS,JANALY,JDATA,JCRITR,	SPT	650
	1 JPRINT,JPLOT	SPT	660
	1 FORMAT (16I5)	SPT	670
	WRITE (KPRINT,103)	SPT	680
	103 FORMAT ('1 * * * * * PROGRAM PARAMETERS * * * * *')	SPT	690
	WRITE (KPRINT,1)JDOAN,JBANDS,NBANDS,NOBS,JANALY,JDATA,JCRITR,	SPT	700
	1 JPRINT,JPLOT	SPT	710
C		SPT	720
C	KTOP=MAX NUMBER OF TIMES THE PROGRAM WILL BE ALLOWED TO TRY IMPROVE-	SPT	730
C	MENTS ON THE WHOLE MULTIVARIATE SPECTRUM. KOUNT IS THE NUMBER OF	SPT	740
C	C-SUCH TRIES.	SPT	750
C		SPT	760
	KTOP=4	SPT	770
	KOUNT=0	SPT	780
C		SPT	790
C	SET SIGLEV, THE T-VALUE FOR THE CRITERION OF ACCEPTANCE OF A PEAK.	SPT	800
C	THEN DECIDE HOW TO GET VECTOR OF BANDS.	SPT	810
C		SPT	820
	SIGLEV=2.0	SPT	830
	IF (JBANDS) 100,100,110	SPT	840
C		SPT	850
C	READ IN LIMITS OF BANDS VECTOR IF JBANDS WAS 0 - GENERATE BANDS.	SPT	860
C	OTHERWISE GO TO 110 AND READ IN BANDS FROM CARDS.	SPT	870
C	BANDLO-LOWEST FREQ. OR LONGEST PERIOD, AS APPROPRIATE TO DOMAIN.	SPT	880
C	BANDEL-DELTA(FREQ.) OR DELTA(PERIOD), AS APPROPRIATE TO DOMAIN.	SPT	890
C	BANDS-VECTOR OF BANDS.	SPT	900
C		SPT	910
	100 READ (KREADR,2) BANDLO,BANDEL	SPT	920
	2 FORMAT (8F10.0)	SPT	930
	BANDS(1)=BANDLO	SPT	940
	DO 120 LBAND=2,NBANDS	SPT	950
	120 BANDS(LBAND)=BANDS(LBAND-1) + BANDEL	SPT	960
	GO TO 130	SPT	970
	110 READ (KREADR,2) (BANDS(LBAND),LBAND=1,NBANDS)	SPT	980
C		SPT	990
C	CONVERT BANDS TO PERIOD DOMAIN IF ORIGINATED IN FREQ DOMAIN.	SPT	1000
C	REVERSE THE ORDER OF BANDS SO AS TO BE IN ASCENDING WAVELENGTH ORDER.	SPT	1010
C	ALSO GENERATE BAN, THE FREQ DOMAIN VECTOR OF BANDS.	SPT	1020
C		SPT	1030
	130 IF (JDOAN) 150,150,140	SPT	1040
	140 DO 141 LBAND=1,NBANDS	SPT	1050
	BAN(LBAND)=BANDS(LBAND)	SPT	1060
	141 BANDS(LBAND)=1.0/BANDS(LBAND)	SPT	1070
	CALL REV(BANDS,NBANDS)	SPT	1080
C		SPT	1090
C	GENERATE SIN/COS PREDICTOR MATRIX AS PART OF DATA MATRIX, X. THEN	SPT	1100

C-READ IN DEPENDENT VARIABLE PART OF X. THESE DATA WILL THEN BE ENT-	SPT 1110
C-ERED INTO SUBROUTINE CORRE TO COMPUTE THE CORRELATION MATRIX OF ALL	SPT 1120
C-VARIABLES.	SPT 1130
C	SPT 1140
150 M=NBANDS*2 + 1	SPT 1150
CALL PREGEN(X,NBANDS,NOBS,NBANDS)	SPT 1160
CALL DEPVAR(X,NOBS,JDATA,JDOMAN,JPRINT)	SPT 1170
C	SPT 1180
C-GENERATE VECTOR OF VARIABLE NUMBERS FOR LATER USE.	SPT 1190
C	SPT 1200
DO 155 LV=1,M	SPT 1210
155 LVAR(LV)=LV	SPT 1220
CALL CORRE(NBANDS,M,1,X,XBAR,STD,RX,R,B,D,T)	SPT 1230
C	SPT 1240
C-SET TOPP, THE MAXIMUM ALLOWABLE TOTAL AMPLITUDE IN THE FINAL SPECTRUM	SPT 1250
C-TOPP IS THE TOTAL AMPLITUDE OF THE F(T)+25 PERCENT.	SPT 1260
C	SPT 1270
TOPP=STD(1)+.25*STD(1)	SPT 1280
C	SPT 1290
C-PRINT OUT MATRICES ETC., IF DESIRED	SPT 1300
C	SPT 1310
IF(JPRINT-3) 151,152,152	SPT 1320
152 WRITE (KPRINT,5)	SPT 1330
5 FORMAT('IN A T R I X O F C O R R E L A T I O N S',/, ' V A R I A B S',	SPT 1340
1LE 1 IS THE DEPENDENT VARIABLE, ALL OTHERS ARE COSINE AND SINE WAVS	SPT 1350
2ES OF VARIOUS PERIODS ',/,T88,'-----',/, '0')	SPT 1360
CALL MATPRT(R,M,LVAR)	SPT 1370
C	SPT 1380
C-DECIDE ON PROPER DATA ANALYSIS PATH.	SPT 1390
C	SPT 1400
151 JANALY=JANALY+1	SPT 1410
GO TO (200,400,600),JANALY	SPT 1420
C	SPT 1430
C	SPT 1440
C*****	SPT 1450
C*****	SPT 1460
C	SPT 1470
C	SPT 1480
C-STATEMENTS 200-400 INVOLVE COMPUTATION OF OPTIMIZED K-BANDS SPECTRA	SPT 1490
C	SPT 1500
C-FIRST COMPUTE UNIVARIATE SPECTRUM USING SUBROUTINE USPECT. THEN FIND	SPT 1510
C-ALL SIGNIFICANT SPECTRUM PEAKS IN UNIVARIATE SPECTRUM.	SPT 1520
C	SPT 1530
200 CALL USPECT(R,T,NOBS,M,B,NBANDS,STD,JPRINT,JPLOT,PHASE,BAN,BANDS	SPT 1540
1,AMNAME,TNAME,PHNAME,XNAME,JDOMAN,BANAME)	SPT 1550
CALL PPIKR(R,T,ISAVE,NPEAK,NBANDS,SIGLEV)	SPT 1560
IF (NPEAK) 201,201,202	SPT 1570
201 WRITE (KPRINT,66)	SPT 1580
66 FORMAT('0** * * * NO SIGNIFICANT PEAKS FOUND * * * **')	SPT 1590
GO TO 2000	SPT 1600
C	SPT 1610
C-NOW LOOP THRU AN OPTIMIZING PROCESS TRYING TO FIND LARGEST VALUE OF	SPT 1620
C-EITHER T OR R-SQUARE. THE BEGINNING OF THIS LOOP IS STATEMENT 210	SPT 1630
C	SPT 1640
C-SET A VALUE OF CRIT=0. THIS WILL LATER BE USED TO STORE THE JUST	SPT 1650
C-PRECEDING VALUE OF THE OPTIMIZATION CRITERION. ALSO INITIALIZE THE	SPT 1660

C-VARIABLE MM = -1. MM IS THE DIRECTION OF PEAK SLIDING AS WELL AS THE	SPT 1670
C-COUNTER FOR THE NUMBER OF STEPS.	SPT 1680
C	SPT 1690
202 LPEAK=1	SPT 1700
CRIT=0.0	SPT 1710
MM=0	SPT 1720
210 CALL KSPECT(R,T,NORS,M,NPEAK,ISAVE,RX,8,JPRINT,XBAR,STD,D,RSQ,	SPT 1730
IPHASE,BANDS,BAN)	SPT 1740
C	SPT 1750
C-TEST FOR PRINTOUT	SPT 1760
C	SPT 1770
IF(JPRINT-3)208,209,209	SPT 1780
209 WRITE (KPRINT,6) RSQ	SPT 1790
6 FORMAT ('MULTIPLE SQUARED CORRELATION=',F8.4)	SPT 1800
WRITE (KPRINT,7)	SPT 1810
7 FORMAT (' PERIOD/FREQ.',T20,'AMPLITUDE',T40,'T-VALUE')	SPT 1820
DO 214 LO=1,NPEAK	SPT 1830
KK=ISAVE(LO)	SPT 1840
IF (JDOMAN) 212,212,213	SPT 1850
212 BB=BANDS(KK)	SPT 1860
GO TO 214	SPT 1870
213 BB=BAN(KK)	SPT 1880
214 WRITE (KPRINT,8) BB,B(KK),T(KK)	SPT 1890
8 FORMAT (2F12.4,F18.4)	SPT 1900
C	SPT 1910
C-SELECT CRITERION FOR GOODNESS OF FIT - CHECK FOR IMPROVEMENT	SPT 1920
C	SPT 1930
208 IF (CRIT(RSQ,T,JCRITR,LPEAK)-CRIT) 220,220,230	SPT 1940
C	SPT 1950
C-A BRANCH TO 220 IMPLIES NON-IMPROVEMENT. EITHER RESORE OLD VALUE AND	SPT 1960
C-GO TO NEXT PEAK (221 OR 223), OR TRY MOVING UP (222).	SPT 1970
C	SPT 1980
220 IF (MM+1) 221,222,223	SPT 1990
C	SPT 2000
C-A BRANCH TO 221 IMPLIES THAT WE HAVE BEEN MOVING DOWN FOR 2 OR MORE	SPT 2010
C-STEPS. THIS IS THE FIRST NON-IMPROVEMENT. RESTORE JUST FORMER VALUE	SPT 2020
C-AND GO TO NEXT PEAK.	SPT 2030
C	SPT 2040
221 ISAVE(LPEAK)=ISAVE(LPEAK)+1	SPT 2050
MM=-1	SPT 2060
LPEAK=LPEAK+1	SPT 2070
ISAVE(LPEAK)=ISAVE(LPEAK)-1	SPT 2080
GO TO 300	SPT 2090
C	SPT 2100
C-A BRANCH TO 222 IMPLIES FIRST MOVE DOWN AND NON-IMPROVEMENT. TRY	SPT 2110
C-MOVING SAME PEAK UP	SPT 2120
C	SPT 2130
222 MM=1	SPT 2140
ISAVE(LPEAK)=ISAVE(LPEAK)+2	SPT 2150
IF (ISAVE(LPEAK)-NBANDS) 300,225,225	SPT 2160
225 WRITE (KPRINT,3)	SPT 2170
3 FORMAT ('O* * * * W A R N I N G * - JUST TRIED TO MOVE A PEAK INSPT	SPT 2180
1TO THE LONGEST PERIOD (LOWEST FREQUENCY) BAND. TRY WIDER SPECTRUMSPT	SPT 2190
2 LIMITS.')	SPT 2200
GO TO 2000	SPT 2210
C	SPT 2220

C-A BRANCH TO 223 IMPLIES THAT WE HAVE BEEN MOVING UP AND IT DIDNT HELP.	SPT 2230
C-RESTORE JUST PRIOR VALUE AND GO TO NEXT PEAK.	SPT 2240
C	SPT 2250
223 ISAVE(LPEAK)=ISAVE(LPEAK)-1	SPT 2260
MM=-1	SPT 2270
LPEAK=LPEAK+1	SPT 2280
ISAVE(LPEAK)=ISAVE(LPEAK)-1	SPT 2290
GO TO 300	SPT 2300
C	SPT 2310
C	SPT 2320
C-A BRANCH TO 230 IMPLIES IMPROVEMENT. CONTINUE IN SAME DIRECTION.	SPT 2330
C	SPT 2340
230 IF (MM) 231,231,232	SPT 2350
C	SPT 2360
C-A BRANCH TO 231 IMPLIES WE WERE MOVING DOWN. - CONTINUE SAME DIRECTION	SPT 2370
C	SPT 2380
231 MM=MM-1	SPT 2390
CRIT=CRITR(RSQ,T,JCRITR,LPEAK)	SPT 2400
ISAVE(LPEAK)=ISAVE(LPEAK)-1	SPT 2410
IF (ISAVE(LPEAK)-1) 234,234,300	SPT 2420
234 WRITE (KPRINT,4)	SPT 2430
4 FORMAT('0** * * * W A R N I N G * - JUST TRIED TO MOVE A PEAK INT	SPT 2440
10 THE SHORTEST PERIOD (HIGHEST FREQUENCY) BAND. TRY WIDER SPECTRUS	SPT 2450
2M LIMITS')	SPT 2460
GO TO 2000	SPT 2470
C	SPT 2480
C-A BRANCH TO 232 IMPLIES WE WERE MOVING UP. - CONTINUE SAME DIRECTION.	SPT 2490
C	SPT 2500
232 MM=MM+1	SPT 2510
CRIT=CRITR(RSQ,T,JCRITR,LPEAK)	SPT 2520
ISAVE(LPEAK)=ISAVE(LPEAK)+1	SPT 2530
IF (ISAVE(LPEAK)-NBANDS) 300,225,225	SPT 2540
C	SPT 2550
C	SPT 2560
C-STATEMENT 300 CHECKS TO SEE THAT WE ARE NOT OFF THE END OF THE ISAVE	SPT 2570
C-VECTOR. IF NOT, DO ANOTHER K-BANDS SPECTRUM WITH NEW ISAVE VECTOR	SPT 2580
C-VALUES. IF WE ARE OFF THE END, COMPUTE A NEW FULL SPECTRUM USING A	SPT 2590
C-K-VARIATE MODEL. ALSO CHECK FOR VALUES OF ISAVE EQUAL TO EACH OTHER.	SPT 2600
C-IF WE HAVE JUST MOVED INTO A ANOTHER PEAK, REDUCE NPEAK BY ONE AND	SPT 2610
C-PACK THE VECTOR DOWN AND START PROCESS OVER AT LPEAK=1.	SPT 2620
C	SPT 2630
300 IF (LPEAK-NPEAK) 320,320,310	SPT 2640
320 IF (LPEAK-1) 322,322,321	SPT 2650
321 IF (ISAVE(LPEAK)-ISAVE(LPEAK-1)) 322,323,322	SPT 2660
322 IF (LPEAK-NPEAK) 324,210,324	SPT 2670
324 IF (ISAVE(LPEAK)-ISAVE(LPEAK+1)) 210,325,210	SPT 2680
323 DO 330 LL=LPEAK,NPEAK	SPT 2690
330 ISAVE(LL-1)=ISAVE(LL)	SPT 2700
NPEAK=NPEAK-1	SPT 2710
LPEAK=1	SPT 2720
MM=0	SPT 2730
CRIT=0.0	SPT 2740
GO TO 210	SPT 2750
325 NPEAK=NPEAK-1	SPT 2760
DO 331 LL=LPEAK,NPEAK	SPT 2770
331 ISAVE(LL)=ISAVE(LL+1)	SPT 2780

LPEAK=1	SPT 2790
MM=0	SPT 2800
CRIT=0.0	SPT 2810
GO TO 210	SPT 2820
C	SPT 2830
C-A BRANCH TO 310 OCCURS WHEN OPTIMIZATION OF THE K-BANDS MODEL IS	SPT 2840
C-COMplete. NOW COMPUTE A FULL SPECTRUM USING THE OPTIMIZED K-BANDS	SPT 2850
C-MODEL. SEARCH NEW K-B SPECTRUM FOR PEAKS AND SEE IF ANY NEW ONES TUR-	SPT 2860
C-NED UP. IF SO, GO THRU WHOLE OPTIMIZATION ROUTINE AGAIN.	SPT 2870
C	SPT 2880
310 IF (JPRINT-3)360,361,361	SPT 2890
361 WRITE (KPRINT,9)	SPT 2900
9 FORMAT('COMPUTING SPECTRUM USING THE FOLLOWING BANDS IN MODEL')	SPT 2910
IF (JDDMAN)362,362,363	SPT 2920
362 DO 364 LO=1,NPEAK	SPT 2930
KK=ISAVE(LO)	SPT 2940
364 WRITE (KPRINT,8) BANDS(KK)	SPT 2950
GO TO 360	SPT 2960
363 DO 366 LO=1,NPEAK	SPT 2970
KK=ISAVE(LO)	SPT 2980
366 WRITE (KPRINT,8) BAN(KK)	SPT 2990
360 CALL MULTI(ISAVE,NPEAK,NBANDS,R,T,NQBS,M,RX,B,XBAR,STD,D,RSQ,	SPT 3000
1 PHASE,BANDS,BAN)	SPT 3010
KOUNT=KOUNT+1	SPT 3020
IF (KOUNT-KTOP) 384,384,385	SPT 3030
385 WRITE (KPRINT,386)	SPT 3040
386 FORMAT('THE PROGRAM IS PROBABLY CAUGHT IN A LOOP. TRY DIFFERENT	SPT 3050
INPUT PARAMETERS AND SUBMIT AGAIN')	SPT 3060
GO TO 2000	SPT 3070
384 CALL PPIKR(B,T,ISAVE,NPEEK,NBANDS,SIGLEV)	SPT 3080
IF (NPEAK-NPEEK) 311,350,311	SPT 3090
311 NPEAK=NPEEK	SPT 3100
LPEAK=1	SPT 3110
MM=0	SPT 3120
CRIT=0.0	SPT 3130
GO TO 210	SPT 3140
C	SPT 3150
C-A STABLE STATE IN THE OPTIMIZING ROUTINE RESULTS IN A BRANCH TO 350.	SPT 3160
C-OUTPUT RESULTS.-	SPT 3170
C	SPT 3180
350 WRITE (KPRINT,67)	SPT 3190
67 FORMAT('O H U L T I P L E B A N D S P E C T R U M')	SPT 3200
CALL OUTPUT(BANDS,BAN,B,T,PHASE,NBANDS,AMNAME,TNAME,PHNAME,	SPT 3210
1BANAME,XNAME,JPRINT,JPLOT,JDDMAN)	SPT 3220
WRITE (KPRINT,6) RSQ	SPT 3230
C	SPT 3240
C-CHECK FINAL SPECTRUM FOR EXCESSIVE TOTAL POWER IN SIGNIFICANT BANDS.	SPT 3250
C	SPT 3260
CALL TOTAM(X,NQBS,NPEAK,ISAVE,M,PHASE,B,SUMB)	SPT 3270
IF(SUMB-TOPP) 381,382,382	SPT 3280
382 WRITE (KPRINT,383)	SPT 3290
383 FORMAT('PROGRAM FAILED BY FINDING TOO MUCH POWER IN THE SPECTRUM.	SPT 3300
1',/, ' SUGGEST ALTERING PARAMETERS OF THE ANALYSIS, SUCH AS',/,	SPT 3310
2' USE WIDER SPECTRUM LIMITS, FILTER DATA, ALTER DELTAP, ETC.')	SPT 3320
381 GO TO 2000	SPT 3330
C	SPT 3340

C	SPT 3350
C*****	SPT 3360
C*****	SPT 3370
C	SPT 3380
C	SPT 3390
C-STATEMENTS 400-600 INVOLVE COMPUTATION OF THE SIMPLE, SINGLE BAND	SPT 3400
C-SPECTRUM ONLY.	SPT 3410
C	SPT 3420
400 CALL USPECT(R,T,NOBS,M,B,NBANDS,STD,JPRINT,JPLOT,PHASE,BAN,BANDS,	SPT 3430
1 AMNAME,TNAME,PHNAME,XNAME,JDOMAN,BANAME)	SPT 3440
GO TO 2000	SPT 3450
C	SPT 3460
C	SPT 3470
C*****	SPT 3480
C*****	SPT 3490
C	SPT 3500
C	SPT 3510
C-STATEMENTS 600-800 INVOLVE COMPUTATION OF A SPECIFIC K-BAND MODEL	SPT 3520
C-WITHOUT OPTIMIZATION.	SPT 3530
C	SPT 3540
C-FIRST READ IN MODEL PARAMETERS, BUILD VECTOR OF BANDS IN MODEL, THEN	SPT 3550
C-COMPUTE SPECTRUM.	SPT 3560
C	SPT 3570
600 READ (KREADR,1) NPEAK	SPT 3580
READ (KREADR,2) (PEAKS(LPEAK),LPEAK=1,NPEAK)	SPT 3590
DO 610 LPEAK=1,NPEAK	SPT 3600
DO 620 LBAND=1,NBAND	SPT 3610
IF (PEAKS(LPEAK)-BANDS(LBAND)) 620,630,620	SPT 3620
630 ISAVE(LPEAK)=LBAND	SPT 3630
GO TO 610	SPT 3640
620 CONTINUE	SPT 3650
610 CONTINUE	SPT 3660
CALL MULTI(ISAVE,NPEAK,NBANDS,R,T,NOBS,M,RX,B,XBAR,STD,D,RSQ,	SPT 3670
1 PHASE,BANDS,BAN)	SPT 3680
WRITE (KPRINT,5)	SPT 3690
CALL OUTPUT(BANDS,BAN,B,T,PHASE,NBANDS,ANAME,TNAME,PHNAME,	SPT 3700
1 BANAME,XNAME,JPRINT,JPLOT,JDOMAN)	SPT 3710
WRITE (KPRINT,6) RSQ	SPT 3720
2000 STOP	SPT 3730
END	SPT 3740

C		REV	10
C		REV	20
	SUBROUTINE REV(X,N)	REV	30
	DIMENSION X(50)	REV	40
C		REV	50
C	*****	REV	60
C *		* REV	70
C *	SUBROUTINE R E V	* REV	80
C *		* REV	90
C *	REV TAKES A VECTOR AND REVERSES ITS ORDER.	* REV	100
C *		* REV	110
C	*****	REV	120
C		REV	130
	J=N+1	REV	140
	MID=N/2	REV	150
	DO 10 L=1,MID	REV	160
	J=J-1	REV	170
	SAVE=X(L)	REV	180
	X(L)=X(J)	REV	190
10	X(J)=SAVE	REV	200
	RETURN	REV	210
	END	REV	220

C		DEPV 10
C		DEPV 20
	SUBROUTINE DEPVAR(X,NOBS,JDATA,JDOMAN,JPRINT)	DEPV 30
	DIMENSION X(1)	DEPV 40
	COMMON KREADR	DEPV 50
C		DEPV 60
C	*****	DEPV 70
C *		* DEPV 80
C *	SUBROUTINE D E P V A R	DEPV 90
C *		* DEPV 100
C *	DEPVAR EITHER READS IN OR GENERATES (VIA SIMULA), A DEPENDENT	* DEPV 110
C *	VARIABLE VECTOR OF LENGTH NOBS. THE DEPENDENT VARIABLE IS STORED*	DEPV 120
C *	INTO THE FIRST NOBS CELLS OF X, A MATRIX OF VARIABLES STORED AS A*	DEPV 130
C *	VECTOR OF COLUMNS. SEE SUBROUTINE PREGEN FOR REST OF X.	* DEPV 140
C *		* DEPV 150
C	*****	DEPV 160
C		DEPV 170
	C-IF JDATA IS 0 - READ FROM CARDS. (10X,7F10.0)	DEPV 180
	C-IF JDATA IS 1 - CALL SIMULA WHICH GENERATES DATA USING A MONTE CARLO	DEPV 190
	C-SYSTEM ALONG WITH DETERMINISTIC DATA. SIMULA READS CARDS.	DEPV 200
C		DEPV 210
	IF (JDATA) 10,10,50	DEPV 220
	10 READ (KREADR,1) (X(L),L=1,NOBS)	DEPV 230
	1 FORMAT (10X,7F10.0)	DEPV 240
	GO TO 20	DEPV 250
	50 CALL SIMULA(X,NOBS,JDATA,JDOMAN,JPRINT)	DEPV 260
	20 RETURN	DEPV 270
	END	DEPV 280

C		PRED 10
C		PRED 20
	SUBROUTINE PREGEN(X,BANDS,NOBS,NBANDS)	PRED 30
	DIMENSION X(1),BANDS(1)	PRED 40
C		PRED 50
C	*****	PRED 60
C *		* PRED 70
C *	SUBROUTINE P R E G E N	* PRED 80
C *		* PRED 90
C *	PREGEN GENERATES THE SINE AND COSINE PREDICTOR WAVES AND STORES	* PRED 100
C *	THEM IN MATRIX X. MATRIX X IS THE DATA MATRIX HAVING NOBS ROWS	* PRED 110
C *	AND M COLUMNS. HERE NOBS= THE NUMBER OF OBSERVATIONS AND	* PRED 120
C *	BANDS IS A VECTOR OF PERIOD VALUES IN THE SPECTRUM.	* PRED 130
C *		* PRED 140
C *	MATRIX X IS STORED IN VECTOR MODE. SEE IBM SYSTEM/360 SUB-	* PRED 150
C *	ROUTINE PACKAGE (360A-CM-03X) VERSION III, PROGRAMMER'S MANUAL,	* PRED 160
C *	PUBLICATION NUMBER H20-0205-3, PAGES 3-6. ESSENTIALLY EACH COL-	* PRED 170
C *	UMN OF MATRIX X IS STRUNG END-TO-END INTO ONE LONG VECTOR.	* PRED 180
C *		* PRED 190
C *	THE FIRST NOBS VALUES OF VECTOR (MATRIX) X WILL BE THE DEPENDENT	* PRED 200
C *	VARIABLE (SEE SUBROUTINE DEPVAR). THE NEXT NOBS POINTS (COLUMN	* PRED 210
C *	TWO) WILL CONTAIN COS WAVE, BAND 1, THE NEXT NOBS POINTS (COLUMN	* PRED 220
C *	THREE CONTAINS SIN WAVE, BAND 1, ETC.	* PRED 230
C *		* PRED 240
C	*****	PRED 250
C		PRED 260
C	C-CONVERT TO RADIANS/OBSERVATION AND LOOP THRU NBANDS TIMES.	PRED 270
C		PRED 280
	L=NOBS	PRED 290
	DO 10 LBAND=1,NBANDS	PRED 300
	AFREQ=6.28318/BANDS(LBAND)	PRED 310
	EF=-AFREQ	PRED 320
	DO 20 LOBS=1,NOBS	PRED 330
	L=L+1	PRED 340
	EF=EF+AFREQ	PRED 350
	20 X(L)=COS(EF)	PRED 360
	EF=-AFREQ	PRED 370
	DO 10 LOBS=1,NOBS	PRED 380
	L=L+1	PRED 390
	EF=EF+AFREQ	PRED 400
	10 X(L)=SIN(EF)	PRED 410
C		PRED 420
C	C-X CONTAINS THE VECTORS OF SIN/COS WAVES STRUNG END-TO-END. THIS IS	PRED 430
C	EQUIVALENT TO A MATRIX WHERE EACH SIN OR COS WAVE FORMS A COLUMN OF	PRED 440
C	C-NOBS LENGTH.	PRED 450
C		PRED 460
	RETURN	PRED 470
	END	PRED 480

C		SIML 10
C		SIML 20
	SUBROUTINE SIMULA(X,N,J,JDOMAN,JPRINT)	SIML 30
	DIMENSION X(1),A(130),BAND(1)	SIML 40
	COMMON KREADR,KPRINT	SIML 50
C		SIML 60
C	*****	SIML 70
C *		* SIML 80
C *	SUBROUTINE S I M U L A	* SIML 90
C *		* SIML 100
C *	SIMULA IS A PRIMITIVE MONTE CARLO AND SIGNAL GENERATOR FOR CREAT--	* SIML 110
C *	ING ARTIFICIAL DATA. GAUSSIAN DATA ARE READ IN FROM CARDS AND	* SIML 120
C *	A NUMBER OF SINE WAVES OF VARIABLE FREQUENCY AND AMPLITUDE ARE	* SIML 130
C *	ADDED.	* SIML 140
C *		* SIML 150
C	*****	SIML 160
C		SIML 170
C	C-ZERO VECTOR X AND PRINT HEADING	SIML 180
C		SIML 190
	DO 100 L=1,N	SIML 200
	100 X(L)=0.0	SIML 210
	IF (JPRINT) 110,110,120	SIML 220
	120 WRITE (KPRINT,121)	SIML 230
	121 FORMAT('I M O N T E C A R L O SIMULATED DATA',/,*0')	SIML 240
C		SIML 250
C	C-READ IN MODEL SPECIFICATIONS - GENERATE SINES AND ADD NOISE	SIML 260
C	NSIN-NUMBER OF SINE WAVES IN DATA	SIML 270
C	BAND-FREQ. OR PERIOD OF THE LSINTH SINE WAVE	SIML 280
C	SD-STANDARD DEVIATION OF THE LSINTH SINE WAVE. (AMPLITUDE)	SIML 290
C	SON-STANDARD DEV. OF GAUSSIAN NOISE	SIML 300
C		SIML 310
	110 READ (KREADR,1) NSIN	SIML 320
	1 FORMAT (15)	SIML 330
	DO 10 LSIN=1,NSIN	SIML 340
	READ (KREADR,2) BAND(1),SD	SIML 350
	2 FORMAT (2F10.0)	SIML 360
	IF (JDOMAN)20,20,30	SIML 370
	30 BAN=BAND(1)	SIML 380
	BAND(1)=1.0/BAND(1)	SIML 390
	GO TO 21	SIML 400
	20 BAN=1.0/BAND(1)	SIML 410
	21 IF (JPRINT) 25,25,22	SIML 420
	22 WRITE (KPRINT,3) LSIN, BAND(1), BAN,SD	SIML 430
	3 FORMAT(' BAND',13,' - PERIOD=',F10.4,', FREQUENCY=',F10.4,', AMPLITUDE=',F10.4)	SIML 440
	25 AFREQ=6.28318/BAND(1)	SIML 450
	EF=-AFREQ	SIML 460
	DO 26 L=1,N	SIML 470
	EF=EF+AFREQ	SIML 480
	26 A(L)=SIN(EF)*1.41421	SIML 490
	DO 10 L=1,N	SIML 500
	10 X(L)=X(L)+A(L)*SD	SIML 510
C		SIML 520
C	C-READ IN NOISE SD AND NOISE CARDS	SIML 530
		SIML 540

C

READ (KREADR,2) SDN	SIML 550
IF(SDN) 1000,1000,40	SIML 560
40 IF (JPRINT) 50,50,41	SIML 570
41 WRITE (KPRINT,5) SDN	SIML 580
5 FORMAT('RANDOM GAUSSIAN NOISE AMPLITUDE=',F10.4)	SIML 590
50 READ (KREADR,6) (A(L),L=1,N)	SIML 600
6 FORMAT(4X,10F6.4)	SIML 610
DO 60 L=1,N	SIML 620
60 X(L)=A(L)*SDN+X(L)	SIML 630
1000 RETURN	SIML 640
END	SIML 650
	SIML 660

ORIGINAL PAGE IS
OF POOR QUALITY

C		MATP	10
C		MATP	20
	SUBROUTINE MATPRT(R,M,LVAR)	MATP	30
	DIMENSION R(1),X(15),LVAR(1)	MATP	40
	COMMON KREADR, KPRINT	MATP	50
C		MATP	60
C	*****	MATP	70
C *		* MATP	80
C *	SUBROUTINE M A T P R T	* MATP	90
C *		* MATP	100
C *	MATPRT PRINTS OUT THE LOWER TRIANGULAR MATRIX X WHERE X IS STOR-	* MATP	110
C *	ED IN MODE 1. SEE REFERENCE LISTED IN SUBROUTINE PREGEN.	* MATP	120
C *		* MATP	130
C	*****	MATP	140
C		MATP	150
	C-LOOP THRU AS MANY TIMES AS NEEDED TO PRINT WHOLE MATRIX, EACH TIME	MATP	160
	C-PRINTING 15 COLUMNS BY NRD ROWS.	MATP	170
C		MATP	180
	N1=1	MATP	190
	N2=15	MATP	200
	110 IF (N2-M) 100,100,10	MATP	210
	10 N2=M	MATP	220
	100 WRITE (KPRINT,1) (LVAR(LV),LV=N1,N2)	MATP	230
	1 FORMAT('0',2X,15I7)	MATP	240
	WRITE (KPRINT,2)	MATP	250
	2 FORMAT('0')	MATP	260
C		MATP	270
	C-PRINT ONE ROW AT A TIME. MATRIX R IS MODE 1, UPPER TRIANGULAR.	MATP	280
	C-THEREFORE REVERSE SUBSCRIPTS TO MAKE LOWER TRIANGULAR.	MATP	290
C		MATP	300
	DO 20 LROW=N1,M	MATP	310
	IF (LROW-N2) 21,21,22	MATP	320
21	LIMIT=LROW	MATP	330
	GO TO 23	MATP	340
22	LIMIT=N2	MATP	350
23	L=0	MATP	360
	DO 30 LCOL=N1,LIMIT	MATP	370
	L=L+1	MATP	380
	CALL LOC(LCOL,LROW,K,M,M,1)	MATP	390
30	X(L)=R(K)	MATP	400
20	WRITE (KPRINT,3) (LROW,(X(K),K=1,L))	MATP	410
	3 FORMAT(1X,13,2X,15F7.3)	MATP	420
	N1=N1+15	MATP	430
	N2=N1+14	MATP	440
	IF (M-N1) 1000,110,110	MATP	450
1000	RETURN	MATP	460
	END	MATP	470

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C		USPT 10
C		USPT 20
	SUBROUTINE USPECT(R,T,N ,M,B,NBANDS,STD,JPRINT,JPLOT,PHASE,BAN,	USPT 30
	I BANDS,AMNAME,TNAME,PHNAME,XNAME,JDDMAN,BANAME)	USPT 40
	DIMENSION R(1),T(1),B(1),STD(1),PHASE(1),BAN(1),BANDS(1),AMNAME(1)	USPT 50
	I,TNAME(1),PHNAME(1),XNAME(1),BANAME(1)	USPT 60
	COMMON KREADR,KPRINT	USPT 70
C		USPT 80
C	*****	USPT 90
C *		* USPT 100
C	SUBROUTINE U S P E C T	USPT 110
C *		* USPT 120
C *	USPECT COMPUTES THE UNIVARIATE SPECTRUM BY MULTIPLYING THE CORR-	* USPT 130
C *	ELATION OF THE TIME SERIES WITH A SIN OR COS PREDICTOR BY THE	* USPT 140
C *	RATIO OF STANDARD DEVIATIONS OF THE TWO. THIS IS DONE FOR EACH	* USPT 150
C *	PREDICTOR. LET R=THE CORRELATION OF F(I) WITH A SIN OR COS WAVE	* USPT 160
C *	OF SOME ARBITRARY WAVE LENGTH. LET S =THE STANDARD DEVIATION	* USPT 170
C *	OF THE TIME SERIES AND .707=THE STANDARD DEVIATION OF THE PRED-	* USPT 180
C *	ICTOR WAVE. THEN A(F) = R*(S/.707)	* USPT 190
C *	WHERE A(F)=THE AMPLITUDE OF THE COMPLEX SPECTRUM AT F. THE SIN	* USPT 200
C *	AND COS COMPONENTS ARE COMBINED AT EACH WAVE LENGTH AND PHASE	* USPT 210
C *	ANGLE IS COMPUTED. T-VALUES ARE ALSO COMPUTED FOR EACH BAND.	* USPT 220
C *	R=UPPER TRIANGULAR CORRELATION MATRIX, IN STORAGE MODE 1. SEE	* USPT 230
C *	IBM PUBLICATION REFERENCED IN SUBROUTINE PREGN. (INPUT)	* USPT 240
C *	T=VECTOR OF T-VALUES. (OUTPUT)	* USPT 250
C *	NOBS=NUMBER OF OBSERVATIONS. (INPUT)	* USPT 260
C *	M=TOTAL NUMBER OF DATA VECTORS. M=NBANDS*2 + 1. ONE VECTOR FOR	* USPT 270
C *	THE DEPENDENT VARIABLE AND TWO FOR THE SIN/COS WAVES AT EACH WAVE	* USPT 280
C *	LENGTH. (INPUT). B=VECTOR OF SPECTRUM ESTIMATES. (OUTPUT)	* USPT 290
C *	NBANDS=LENGTH OF VECTORS T,B AND PHASE. (INPUT)	* USPT 300
C *	STD=STANDARD DEVIATIONS OF ALL VARIABLES. (INPUT)	* USPT 310
C *	JPRINT=PRINT CONTROL - SEE MAINLINE. (INPUT)	* USPT 320
C *	JPLOT=PLOT CONTROL - SEE MAINLINE. (INPUT)	* USPT 330
C *	PHASE=VECTOR OF PHASE ANGLES. (OUTPUT)	* USPT 340
C *		* USPT 350
C	*****	USPT 360
	LBAND=0	USPT 370
C		USPT 380
	C-EXTRACT VECTOR OF CORRELATIONS BETWEEN DEPENDENT VARIABLE AND EACH	USPT 390
	C-PREDICTOR VARIABLE.	USPT 400
C		USPT 410
	DO 10 L=2,M	USPT 420
	CALL LOC(1,L,KOOL,M,M,1)	USPT 430
	10 B(L)=R(KOOL)	USPT 440
C		USPT 450
	C-LOOP THRU THE SPECTRUM COMPUTATION NBAND TIMES.	USPT 460
C		USPT 470
	FACT=SQRT(FLOAT(N-2))	USPT 480
	DO 20 L=2,M,2	USPT 490
	K=L+1	USPT 500
	LRAND=LBAND+1	USPT 510
C		USPT 520
	C-CO=COS COMPONENT OF SPECTRUM ESTIMATE	USPT 530
	C-SI=SIN COMPONENT OF SPECTRUM ESTIMATE	USPT 540

C-TC=T-VALUE FOR COS COMPONENT	USPT 550
C-TS=T-VALUE FOR SIN COMPONENT	USPT 560
C	USPT 570
CO=B(L)*STD(1)/.707	USPT 580
SI=B(K)*STD(1)/.707	USPT 590
TC=B(L)*FACT/SQRT(1.0-B(L)**2)	USPT 600
TS=B(K)*FACT/SQRT(1.0-B(K)**2)	USPT 610
C	USPT 620
C-COMPUTE SPECTRUM AMPLITUDE, T-VALUE AND PHASE ANGLE	USPT 630
C	USPT 640
B(LBAND)=SQRT(CO**2 + SI**2)	USPT 650
T(LBAND)=SQRT(TC**2 + TS**2)	USPT 660
20 PHASE(LBAND)=ATAN(CO/SI)	USPT 670
C	USPT 680
C-PRINT AND/OR PLOT IF DESIRED	USPT 690
C	USPT 700
JPR=JPRINT-1	USPT 740
JPL=JPLT-1	USPT 750
IF (JPR) 50,50,60	USPT 760
50 IF (JPL) 1000,1000,60	USPT 770
60 WRITE(KPRINT,1)	USPT 780
1 FORMAT('0 SINGLE BAND SPECTRUM')	USPT 790
CALL OUTPUT(BANDS,BAN,B,T,PHASE,NBANDS,AMNAME,TNAME,PHNAME	USPT 800
1,BANAME,XNAME,JPRINT,JPLT,JDOMAN)	USPT 810
1000 RETURN	USPT 820
END	USPT 830

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C		PPIK	10
C		PPIK	20
	SUBROUTINE PPIKR(B,T,ISAVE,NPEAK,NBANDS,SIGLEV)	PPIK	30
	DIMENSION B(1),T(1),ISAVE(1)	PPIK	40
C		PPIK	50
C	*****	PPIK	60
C	*	* PPIK	70
C	SUBROUTINE P P I K R	* PPIK	80
C	*	* PPIK	90
C	PPIKR RETURNS THE VECTOR INDEX OF ALL SIGNIFICANT SPECTRUM PEAKS.	* PPIK	100
C	B-INPUT VECTOR OF AMPLITUDE SPECTRUM ESTIMATES	* PPIK	110
C	T-INPUT VECTOR OF T-VALUES FOR EACH SPECTRUM ESTIMATE	* PPIK	120
C	ISAVE-OUTPUT VECTOR OF INDEX NUMBERS OF SIGNIFICANT PEAKS	* PPIK	130
C	NPEAK-OUTPUT SCALAR - NUMBER OF PEAKS FOUND	* PPIK	140
C	NBANDS-INPUT SCALAR - NUMBER OF BANDS IN SPECTRUM	* PPIK	150
C	SIGLEV-INPUT SCALAR - CRITERION WHICH T-VALUE FOR A PEAK MUST	* PPIK	160
C	EXCEED IN ORDER TO BE RETAINED	* PPIK	170
C	*	* PPIK	180
C	*****	PPIK	190
C		PPIK	200
C	C-SEARCH FOR PEAKS, RETAIN 'SIGNIFICANT' ONES, BUILD ISAVE.	PPIK	210
C		PPIK	220
	NPEAK=0	PPIK	230
	DO 10 L=2,NBANDS	PPIK	240
	IF (B(L-1)-B(L)) 20,10,10	PPIK	250
20	IF (B(L+1)-B(L)) 40,10,10	PPIK	260
40	IF (T(L)-SIGLEV) 10,50,50	PPIK	270
50	NPEAK=NPEAK+1	PPIK	280
	ISAVE(NPEAK)=L	PPIK	290
10	CONTINUE	PPIK	300
	RETURN	PPIK	310
	END	PPIK	320

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C		CRIT 10
C		CRIT 20
	FUNCTION CRITR(RSQ,T,JCRITR,L)	CRIT 30
	DIMENSION T(1)	CRIT 40
C		CRIT 50
C	*****	CRIT 60
C *		* CRIT 70
C *	FUNCTION C R I T R	* CRIT 80
C *		* CRIT 90
C *	CRITR SELECTS A CRITERION FOR THE SPECTRUM OPTIMIZATION BY PEAK	* CRIT 100
C *	SHIFTING. SELECTS EITHER R-SQUARE OR THE APPROPRIATE T VALUE.	* CRIT 110
C *		* CRIT 120
C	*****	CRIT 130
C		CRIT 140
C	C-SELECT APPROPRIATE VALUE FOR CRITERION.	CRIT 150
C	RSQ-INPUT SCALAR - VALUE OF R-SQUARE	CRIT 160
C	T-INPUT VECTOR - T-VALUES	CRIT 170
C	JCRITR-CONTROL DIGIT FOR SELECTION OF EITHER RSQ OR T(L) AS CRITERION	CRIT 180
C	0=RSQ AS CRITERION	CRIT 190
C	1=T-VALUE AS CRITERION	CRIT 200
C	L-INDEX VALUE OF VECTOR T	CRIT 210
C		CRIT 220
	IF (JCRITR) 10,10,20	CRIT 230
10	CRITR=RSQ	CRIT 240
	GO TO 30	CRIT 250
20	CRITR=T(L)	CRIT 260
30	RETURN	CRIT 270
	END	CRIT 280

C		KSPT 10
C		KSPT 20
	SUBROUTINE <SPECT(R,T,N,M,NPEAK,ISAV ,RX,B,JPRINT,XBAR,STD,D,RSQ,	KSPT 30
	1PHASE, BANDS,BAN)	KSPT 40
	DIMENSION ISAVE(100) ,R(1),T(1),RX(1),B(1),XBAR(1),STD(1),D(1),	KSPT 50
	1PHASE(1),BANDS(1),BAN(1) ,ANS(10),ISAV(1),RY(100)	KSPT 60
	COMMON KREADR,KPRINT	KSPT 70
	C-CONVERT ISAV TO ISAVE, FROM FREQ BAND VECTOR TO VECTOR OF SIN/COS PAIR	KSPT 80
C		KSPT 90
	98521 FORMAT ('OJKL=',15)	KSPT 100
	K=0	KSPT 110
	DO 100 L=1,NPEAK	KSPT 120
	K=K+1	KSPT 130
	ISAVE(K)=ISAV(L)*2	KSPT 140
	K=K+1	KSPT 150
	100 ISAVE(K)=ISAVE(K-1)+1	KSPT 160
C		KSPT 170
	C-SELECT SUB-MATRIX OF PREDICTORS ETC FROM R, ACCORDING TO ISAVE.	KSPT 180
C		KSPT 190
	CALL ORDERIM,R,1,K ,ISAVE,RX,RY)	KSPT 200
C		KSPT 210
	C-INVERT K-ORDER MATRIX OF PREDICTOR INTERCORRELATIONS, RX	KSPT 220
C		KSPT 230
	CALL MINV(RX,K,DET,B,T)	KSPT 240
	IF (JPRINT-3) 300,400,400	KSPT 250
	400 WRITE (KPRINT,7) DET	KSPT 260
	7 FORMAT('O',/, 'O DETERMINANT =',E30.15)	KSPT 270
C		KSPT 280
	C-COMPUTE REGRESSIONS(SPECTRUM) FOR NPEAK SIZED MODEL.	KSPT 290
C		KSPT 300
	300 CALL MULTRIN,K,XBAR,STD,D,RX,RY,ISAVE,B,SB,T,ANS)	KSPT 310
	RSQ=ANS(2)**2	KSPT 320
C		KSPT 330
	C-CONVERT SPECTRUM TO AMPLITUDES BY COMBINING SIN/COS. PUT INTO D.	KSPT 340
	C-ALSO CONVERT T.	KSPT 350
C		KSPT 360
	NFREQ=0	KSPT 370
	DO 200 L=1,K,2	KSPT 380
	NFREQ=NFREQ+1	KSPT 390
	PHASE(NFREQ)=ATAN(B(L)/B(L+1))	KSPT 400
	B(NFREQ)=SQRT(B(L)**2 + B(L+1)**2)	KSPT 410
	200 T(NFREQ)=SQRT(T(L)**2 + T(L+1)**2)	KSPT 420
	10 RETURN	KSPT 430
	END	KSPT 440

C		MULT 10
C		MULT 20
	SUBROUTINE MULTI(ISAVE,NPEAK,NBANDS,R,T,N,M,RX,B,XBAR,STD,D,RSQ,	MULT 30
	1 PHASE,BANDS,BAN)	MULT 40
	DIMENSION ISAVE(1),R(1),T(1),RX(1),B(1),XBAR(1),STD(1),D(1),PHASE	MULT 50
	1(1),BANDS(1),BAN(1),KSAVE(20),S(20),TSPEC(20),TPH(20)	MULT 60
	COMMON KREADR,KPRINT	MULT 70
C		MULT 80
C	*****	MULT 90
C *		* MULT 100
C *	SUBROUTINE M U L T I	* MULT 110
C *		* MULT 120
C *	MULTI COMPUTES THE FULL SPECTRUM OF A TIME SERIES USING A K+1	* MULT 130
C *	BANDS MODEL WHERE K=THE NUMBER OF PEAKS IN THE OPTOMIZED	* MULT 140
C *	MODEL. THE EXTRA BAND IS THE WAVELENGTH IN QUESTION, THE OTHERS	* MULT 150
C *	ARE THE SIGNIFICANT PEAKS. THE VARIANCE ACCOUNTED FOR BY	* MULT 160
C *	THE SIGNIFICANT PEAKS IS THUS 'ACCOUNTED FOR' IN EACH ESTIMATE.	* MULT 170
C *	WHEN THE CURRENT BAND IS ONE OF THE SIGNIFICANT PEAKS, A SKIP	* MULT 180
C *	OCCURS. VARIABLES DEFINED IN MAINLINE.	* MULT 190
C *		* MULT 200
C	*****	MULT 210
C		MULT 220
C		MULT 230
	C-LOOP THRU ONCE FOR EACH FREQ BAND. NFMOD IS THE NUMBER OF SIGNIFIC-	MULT 240
	C-CANT PEAKS IN MODEL PLUS A CURRENT BAND.	MULT 250
C		MULT 260
	NFMOD=NPEAK+1	MULT 270
	DO 310 LF=1,NBANDS	MULT 280
C		MULT 290
	C-CONSTRUCT NEW ISAVE VECTOR	MULT 300
C		MULT 310
	CALL BUILD(KSAVE,ISAVE,LF,NFMOD,ISKIP,NPEAK)	MULT 320
C		MULT 330
	C-SKIP IF THIS BAND IS IN THE MODEL ALREADY	MULT 340
C		MULT 350
	IF (ISKIP) 320,320,330	MULT 360
C		MULT 370
	C-BRANCH TO 330 IMPLIES THAT THE CURRENT BAND IS ONE OF THE SIGNIFICANT	MULT 380
	C-PEAKS. DO AN NPEAK SPECTRUM AND PICK OUT CURRENT BAND.	MULT 390
C		MULT 400
	330 CALLKSPECT(R,S,N,M,NPEAK,ISAVE,RX,TSPEC,O,XBAR,STD,D,RSQ,TPH,	MULT 410
	1BANDS,BAN)	MULT 420
C		MULT 430
	C-TSPEC CONTAINS ALL MODEL ESTIMATES. PICK THE ONE FOR LF.	MULT 440
C		MULT 450
	DO 331 LLZ=1,NPEAK	MULT 460
	IF (LF-ISAVE(LLZ)) 331,333,331	MULT 470
333	B(LF)=TSPEC(LLZ)	MULT 480
	PHASE(LF)=TPH(LLZ)	MULT 490
	T(LF)=S(LLZ)	MULT 500
331	CONTINUE	MULT 510
	GO TO 310	MULT 520
C		MULT 530
	C-BRANCH TO 320 IMPLIES THAT THIS IS A FULL NFMOD MODEL. DO SPECTRUM	MULT 540

C-AND PICK OUT CURRENT BAND.

C

320 CALLKSPECT(R,S,N,H,NFMOD,KSAVE,RX,TSPEC,O,XBAR,STD,D,RSQ,TPH,

1 BANDS,BANI

DO 321 LLL=1,NFMOD

IF(LF-KSAVE(LLL)) 321,322,321

322 T(LF)=S(LLL)

B(LF)=TSPEC(LLL)

PHASE (LF)=TPH(LLL)

321 CONTINUE

310 CONTINUE

RETURN

END

MULT 550

MULT 560

MULT 570

MULT 580

MULT 590

MULT 600

MULT 610

MULT 620

MULT 630

MULT 640

MULT 650

MULT 660

MULT 670

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C		BILD	10
C		BILD	20
	SUBROUTINE BUILD(KSAVE,ISAVE,LF,NFMOD,ISKIP,NPEAK)	BILD	30
	DIMENSION KSAVE(1),ISAVE(1),ASAVE(30),RANC(30)	BILD	40
C		BILD	50
C	*****	BILD	60
C *		* BILD	70
C	SUBROUTINE B U I L D	BILD	80
C *	BUILD CONSTRUCTS VECTOR OF RANKED FREQ BAND NUMBERS GIVEN A	* BILD	90
C *	PARTICULAR MODEL AND A CURRENT FREQUENCY.	* BILD	100
C *	KSAVE - OUTPUT VECTOR TO BE BUILT	* BILD	110
C *	ISAVE - INPUT VECTOR CONTAINING NFREQ SIGNIF PEAKS	* BILD	120
C *	LF - INPUT SCALAR - NEW FREQ BAND TO BE ADDED (CURRENT ONE)	* BILD	130
C *	NFMOD - INPUT - NUMBER OF FREQ BANDS IN NEW MODEL	* BILD	140
C *	ISKIP - OUTPUT CONTROL DIGIT TO KEEP FROM COMPUTING ESTIMATE	* BILD	150
C *	OF ONE OF THE OLD PEAKS AGAIN	* BILD	160
C *	NPEAK - INPUT - NUMBER OF FREQ BANDS IN OLD MODEL	* BILD	170
C *		* BILD	180
C	*****	BILD	190
C		BILD	200
C	C-SEE IF LF IS ALREADY IN MODEL	BILD	210
C		BILD	220
	DO 10 L=1,NPEAK	BILD	230
	IF(LF - ISAVE(L)) 10,99,10	BILD	240
	10 CONTINUE	BILD	250
C		BILD	260
C	C-STORE VECTOR OF ISAVE PLUS LF INTO ASAVE AND RANK IT. RANK STORED IN	BILD	270
C	C-VECTOR RANC	BILD	280
C		BILD	290
	DO 20 L=1,NPEAK	BILD	300
	20 ASAVE(L)=ISAVE(L)	BILD	310
	ASAVE(NFMOD)=LF	BILD	320
	CALL RANK(ASAVE,RANC,NFMOD)	BILD	330
C		BILD	340
C	C-BUILD KSAVE OF RANKED FREQ BANDS	BILD	350
C		BILD	360
	DO 30 L=1,NFMOD	BILD	370
	KOOL=RANC(L)	BILD	380
	30 KSAVE(KOOL)=ASAVE(L)	BILD	390
	ISKIP=0	BILD	400
	GO TO 100	BILD	410
	99 ISKIP=1	BILD	420
	100 RETURN	BILD	430
	END	BILD	440

C		OUTP	10
C		OUTP	20
	SUBROUTINE OUTPUT(BANDS,BAN,B,T,PHASE,NBANDS,AMNAME,TNAME,PHNAME,	OUTP	30
	IBANAME,XNAME,JPRINT,JPLOT,JDOMAN)	OUTP	40
	DIMENSION BANDS(1),BAN(1),B(1),T(1),PHASE(1),AMNAME(1),TNAME(1),	OUTP	50
	IPHNAME(1),BANAME(1),XNAME(1)	OUTP	60
	COMMON KREADR,KPRINT	OUTP	70
C		OUTP	80
C	*****	OUTP	90
C	*	* OUTP	100
C	* SUBROUTINE O U T P U T	* OUTP	110
C	*	* OUTP	120
C	* OUTPUT PRINTS AND/OR PLOTS SPECTRA WITH DOCUMENTATION.	* OUTP	130
C	*	* OUTP	140
C	*****	OUTP	150
C		OUTP	160
C	C-PRINT OUT DOCUMENTATION AND VECTOR ORDER IN APPROPRIATE DOMAIN)	OUTP	170
C	C-FIND SCALE VALUES AND PLOT	OUTP	180
C		OUTP	190
	TOPI=6.28318	OUTP	200
	BTOPI=-TOPI	OUTP	210
	BMAX=B(1)	OUTP	220
	DO 64 LBAND=2,NBANDS	OUTP	230
	IF (BMAX-B(LBAND)) 68,64,64	OUTP	240
68	BMAX=B(LBAND)	OUTP	250
64	CONTINUE	OUTP	260
	TMAX=T(1)	OUTP	270
	DO 66 LBAND=2,NBANDS	OUTP	280
	IF (TMAX-T(LBAND)) 67,66,66	OUTP	290
67	TMAX=T(LBAND)	OUTP	300
66	CONTINUE	OUTP	310
	IF (JDOMAN) 60,60,50	OUTP	320
C		OUTP	330
C	C-REVERSE VECTORS IF FREQ DOMAIN IS USED - PRINT - REVERSE AGAIN.	OUTP	340
C		OUTP	350
	50 CALL REV(B,NBANDS)	OUTP	360
	CALL REV(T,NBANDS)	OUTP	370
	CALL REV(PHASE,NBANDS)	OUTP	380
	IF (JPRINT) 52,52,51	OUTP	390
51	WRITE (KPRINT,2)	OUTP	400
2	FORMAT('OFREQUENCY ',5X,'AMPLITUDE',5X,'T-VALUE',8X,'PHASE',/, '0')	OUTP	410
	DO 55 LBAND=1,NBANDS	OUTP	420
55	WRITE (KPRINT,3) BAN(LBAND),B(LBAND),T(LBAND),PHASE(LBAND)	OUTP	430
3	FORMAT(F10.3,5X,F9.3,5X,F7.3,5X,F8.3)	OUTP	440
52	IF (JPLOT) 54,54,53	OUTP	450
53	CALL PLOT2(B,BMAX,0.0,T,TMAX,0.0,NBANDS,BAN,AMNAME,TNAME,BANAME)	OUTP	460
	CALL PLOT2(PHASE,TOPI,BTOPI,T,TMAX,0.0,NBANDS,BAN,PHNAME,TNAME,	OUTP	470
	1 BANAME)	OUTP	480
54	CALL REV(B,NBANDS)	OUTP	490
	CALL REV(T,NBANDS)	OUTP	500
	CALL REV(PHASE,NBANDS)	OUTP	510
	GO TO 100	OUTP	520
60	IF (JPRINT) 62,62,61	OUTP	530
61	WRITE (KPRINT,4)	OUTP	540

4	FORMAT('PERIOD',5X,'AMPLITUDE',5X,'T-VALUE',8X,'PHASE',/, '0')OUTP	550
00 65	LBAND=1,NBANDS	OUTP 560
65	WRITE (KPRINT,3) BANDS(LBAND),B(LBAND),T(LBAND),PHASE(LBAND)	OUTP 570
62	IF (JPLOT) 100,100,63	OUTP 580
63	CALL PLOT2(B,BMAX,0.0,T,TMAX,0.0,NBANDS,BANDS,AMNAME,TNAME,XNAME)	OUTP 590
	CALL PLOT2(PHASE,TOPI,BTOPI,T,TMAX,0.0,NBANDS,BANDS,PHNAME,TNAME,	OUTP 600
	1 XNAME)	OUTP 610
100	RETURN	OUTP 620
	END	OUTP 630

C		PLT2 10
C		PLT2 20
	SUBROUTINE PLOT2(Y1,YMAX1,YMIN1,Y2,YMAX2,YMIN2,NP,XAX,YNAM1,	PLT2 30
	1 YNAM2,XNAM)	PLT2 40
	DIMENSION Y1(1),Y2(1),LINE(111),XAX(1),XNAM(5),YNAM1(9),YNAM2(9)	PLT2 50
	COMMON KREADR,KPRNT	PLT2 60
	DATA KBLNK/' '/,KBORD/'.'/,KAL/'+'/,KPLOT/'*'/	PLT2 70
C		PLT2 80
C--PLOT2 GENERATES TWO OVER/UNDER	GRAPHS PER PAGE AND CALIBRATES	PLT2 90
C--THEN. Y1=VERTICAL VARIABLE 1, YMAX1, YMIN1=VERTICAL PLOT LIMITS.		PLT2 100
C--Y2, YMAX2, YMIN2=SIMILAR FOR SECON VARIABLE, NP=NUMBER OF POINTS,		PLT2 110
C--XAX=X AXIS (COMMON TO BOTH VARIABLES).		PLT2 120
	WRITE (KPRNT,2) YNAM1,YNAM2,XNAM	PLT2 130
	2 FORMAT('1' / T5,'*'/ T5,'*',T25,'*',T80,'*'/ T5,'*',T25,'****'	PLT2 140
	1,T80,'****'/ T3,'*****',T18,'*****' ,9A4,T73,'*****'	PLT2 150
	2,9A4/T4,'****',T25,'*',T80,'****'/T5,'*',T25,'*',T80,'*'/1X,5A4)	PLT2 160
C		PLT2 170
C--GENERATE SCALE FACTORS		PLT2 180
	SKAL1=50.5/(YMAX1-YMIN1)	PLT2 190
	SKAL2=50.5/(YMAX2-YMIN2)	PLT2 200
C--GENERATE CALIBRATION AND OUTPUT IT.		PLT2 210
	CALO1 = YMIN1	PLT2 220
	CALO2 = YMIN2	PLT2 230
	CAL1 = YMAX1	PLT2 240
	CAL2 = YMAX2	PLT2 250
	CAL51=YMAX1-(.5*(YMAX1-YMIN1))	PLT2 260
	CAL52=YMAX2-(.5*(YMAX2-YMIN2))	PLT2 270
	WRITE (KPRNT,1) CALO1,CAL51,CAL1,CALO2,CAL52,CAL2	PLT2 280
	1 FORMAT (' ',F14.4,F24.4,F23.4,F12.4,F23.4,F24.4)	PLT2 290
C--GENERATE VERTICAL AXIS AND OUTPUT IT		PLT2 300
	DO 10 L = 1,111	PLT2 310
10	LINE(L) = KBORD	PLT2 320
	LINE(1) = KAL	PLT2 330
	LINE(26) = KAL	PLT2 340
	LINE(51) = KAL	PLT2 350
	LINE(61) = KAL	PLT2 360
	LINE(86) = KAL	PLT2 370
	LINE(111)= KAL	PLT2 380
	DO 20 L=52,60	PLT2 390
20	LINE(L) = KBLNK	PLT2 400
	WRITE(KPRNT,4) LINE	PLT2 410
	4 FORMAT(10X,111A1)	PLT2 420
C		PLT2 430
C--DECIDE HOW MANY LINES BETWEEN POINTS		PLT2 440
	NWIDE = 32/NP	PLT2 450
C		PLT2 460
C--LOOP FOR NUMBER OF POINTS, EACH TIME PLOTTING A POINT AND NWIDE SPACE		PLT2 470
	DO 30 LP = 1, NP	PLT2 480
C		PLT2 490
C--CLEAR LINE AND GENERATE GRID POINTS		PLT2 500
	DO 40 L = 1,111	PLT2 510
40	LINE(L) = KBLNK	PLT2 520
	LINE(1)=KBORD	PLT2 530
	LINE(26)=KBORD	PLT2 540

LINE(51)=KBORD	PLT2 550
LINE(61)=KBORD	PLT2 560
LINE(86)=KBORD	PLT2 570
LINE(111)=KBORD	PLT2 580
C	PLT2 590
C--TEST FOR OVER OR UNDER RANGE AND TRUNCATE OUT-OF-BOUNDS VALUES	PLT2 600
IF (Y1(LP)-YMAX1) 2000, 2000, 2100	PLT2 610
2100 YA = YMAX1	PLT2 620
GO TO 5100	PLT2 630
2000 IF (Y1(LP)-YMIN1) 5000, 5200, 5200	PLT2 640
5000 YA = YMIN1	PLT2 650
GO TO 5100	PLT2 660
5200 YA=Y1(LP)	PLT2 670
5100 IF (Y2(LP)-YMAX2) 200, 200, 210	PLT2 680
210 YB = YMAX2	PLT2 690
GO TO 510	PLT2 700
200 IF (Y2(LP)-YMIN2) 500, 520, 520	PLT2 710
500 YB = YMIN2	PLT2 720
GO TO 510	PLT2 730
520 YB=Y2(LP)	PLT2 740
C	PLT2 750
C--NOW GENERATE POINT INDEXES	PLT2 760
510 K1 = (YA -YMIN1)*SKAL1+1.0	PLT2 770
K2 = (YB -YMIN2)*SKAL2+61.0	PLT2 780
LINE(K1)= KPLOT	PLT2 790
LINE(K2)= KPLT	PLT2 800
C	PLT2 810
C--OUTPUT HORIZONTAL SCALE VALUE AND LINE	PLT2 820
WRITE (KPRNT ,3) XAX(LP),LINE	PLT2 830
3 FORMAT (1X,F 8.4,1X,111A11)	PLT2 840
C	PLT2 850
C--CLEAR LINE AND GENERATE BLANK LINES FOR SPACE	PLT2 860
IF (NWIDTH) 30,30,110	PLT2 870
110 DO 95 L=1,111	PLT2 880
95 LINE(L)=KBLNK	PLT2 890
LINE(1)=KBORD	PLT2 900
LINE(51)=KBORD	PLT2 910
LINE(26)=KBORD	PLT2 920
LINE(61)=KBORD	PLT2 930
LINE(86)=KBORD	PLT2 940
LINE(111)=KBORD	PLT2 950
C	PLT2 960
C--OUTPUT PLAIN LINE	PLT2 970
DO 90 LOOP=1,NWIDE	PLT2 980
90 WRITE (KPRNT,4) LINE	PLT2 990
30 CONTINUE	PLT21000
C	PLT21010
C--GENERATE RIGHT BORDER AND OUTPUT	PLT21020
DO 50 L = 1,111	PLT21030
50 LINE(L) = KBORD	PLT21040
LINE(1) = KAL	PLT21050
LINE(26) = KAL	PLT21060
LINE(51) = KAL	PLT21070
LINE(61) = KAL	PLT21080
LINE(86) = KAL	PLT21090
LINE(111) = KAL	PLT21100

DO 80 L= 52.60
80 LINE (L) = KBLNK
WRITE (KPRNT,4) LINE
RETURN
END

PLT21110
PLT21120
PLT21130
PLT21140
PLT21150

C		TOTM 10
C		TOTM 20
	SUBROUTINE TOTAM(X,N,NPEAK,ISAVE,M,PHASE,B,AMP)	TOTM 30
	DIMENSION X(1),ISAVE(1),PHASE(1),B(1)	TOTM 40
C		TOTM 50
C	*****	TOTM 60
C *		* TOTM 70
C *	SUBROUTINE T O T A M	* TOTM 80
C *		* TOTM 90
C *	TOTAM COMPUTES THE RESULTANT AMPLITUDE OF THE SUM OF NPEAK SIN-	* TOTM 100
C *	SOIDS WHICH HAVE THEIR AMPLITUDES AND PHASES DETERMINED BY THE	* TOTM 110
C *	CALLING PROGRAM.. TOTAM SIMPLY SELECTS THE APPROPRIATE SINE	* TOTM 120
C *	AND COSINE WAVES FROM X, WEIGHTS THEM, SUMS THEM AND THEN COM-	* TOTM 130
C *	PUTES THE AMPLITUDE OF THE SUM.	* TOTM 140
C *	W A R N I N G ----- THIS WILL DESTROY ROW 1 OF X WHICH	* TOTM 150
C *	CONTAINS THE ORIGINAL DEPENDENT VARIABLE.	* TOTM 160
C *		* TOTM 170
C	*****	TOTM 180
C		TOTM 190
C	C-LOOP THRU THE FOLLOWING NPEAK TIMES TO CREATE THE RESULTANT WAVE INX	TOTM 200
C		TOTM 210
	DO 100 LP=1,NPEAK	TOTM 220
	K=ISAVE(LP)	TOTM 230
	KC=K*2	TOTM 240
	KS=KC+1	TOTM 250
C		TOTM 260
C	C-THE FOLLOWING COMPUTES THE PROPER AMPLITUDES FOR THE COSINE AND SINE	TOTM 270
C	C-COMPONENTS, BASED ON PHASE AND AMPLITUDE ESTIMATES.	TOTM 280
C		TOTM 290
	PC=1.0	TOTM 300
	PC=PC/(TAN(PHASE(K))+ PC)	TOTM 310
	PS=PC*TAN(PHASE(K))	TOTM 320
C		TOTM 330
C	C-SELECT SINE AND COSIND VALUES FROM X A	TOTM 340
C	C-SELECT SINE AND COSINE VALUES FROM X, SUM AND PUT INTO X, ROW 1.	TOTM 350
C		TOTM 360
	DO 100 L=1,N	TOTM 370
	CALL LOC(KC,L,J,M,N,0)	TOTM 380
	CALL LOC(KS,L,I,M,N,0)	TOTM 390
	100 X(L)=X(J)*PC + X(I)*PS	TOTM 400
C		TOTM 410
C	C-COMPUTE APPLITUDE OF RESULTANT	TOTM 420
C		TOTM 430
	SX=0.0	TOTM 440
	DO 10 L=1,N	TOTM 450
10	SX=SX+X(L)	TOTM 460
	SX=SX/FLOAT(N)	TOTM 470
	SXS=0.0	TOTM 480
	DO 20 L=1,N	TOTM 490
20	SXS=SXS+(X(L)-SX)**2	TOTM 500
	AMP=SQRT(SXS/FLOAT(N))	TOTM 510
	RETURN	TOTM 520
	END	TOTM 530

SUBROUTINE DATA
RETURN
END

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APPENDIX 2

Three Examples of Use of SPECT

NOTE:

In Test 1, as in other tests, it will be noted that the final amplitude spectrum has values around the maxima which are not zero. However, the t-spectra always have only two (or the correct number) of peaks. Amplitude spectra should be interpreted by considering the t-values.

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TEST 1.

THE FOLLOWING IS A LISTING OF THE CONTROL AND DATA CARDS FOR TEST 1.
OUTPUT FOLLOWS.

0	0	20	100	0	1	0	3	2		
19.0		0.5								
2										
22.0		1.0								
25.0		1.0								
1	-3180	-7990	-13340	13910	3820	7330	6530	2190	-6810	11290
2	-13770	-12570	4950	-1390	-8540	4280	-13220	-3150	-7320	-13480
3	23340	-3370	-19550	-6360	-13180	-4330	5450	4280	-2970	2760
4	-11360	6420	34360	-16670	5470	-11730	-3550	350	3590	9300
5	4140	-110	6660	-11320	-4100	-10770	7340	14840	-3400	7890
6	-8940	3640	-12370	-440	-1110	-2100	9310	6160	-3770	-4330
7	10480	370	7590	6090	-20430	-2900	4040	-5430	4860	8690
8	3470	28160	-4640	-6320	-16140	3720	-740	-9160	13140	-380
9	6370	5630	-1070	1310	-18080	-11260	3790	6100	-3640	-26260
10	21760	3930	-9240	19110	-10400	-11680	4850	760	-7690	16070

SUPR

***** PROGRAM PARAMETERS *****
0 0 20 100 0 1 0 3 2

M O N T E C A R L O S I M U L A T E D D A T A

BAND 1 - PERIOD= 22.0000, FREQUENCY= 0.0455, AMPLITUDE= 1.0000
BAND 2 - PERIOD= 25.0000, FREQUENCY= 0.0400, AMPLITUDE= 1.0000
RANDOM GAUSSIAN NOISE AMPLITUDE= 1.0000

SUPR TIME---1:12.7

← 370/165

SUPR TIME---6:08.3

← 360/50

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MATRIX OF CORRELATIONS
VARIABLE 1 IS THE DEPENDENT VARIABLE, ALL OTHERS ARE COSINE AND SINE WAVES OF VARIOUS PERIODS

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	1.000														
2	-0.339	1.000													
3	0.056	0.000	1.000												
4	-0.453	0.658	0.631	1.000											
5	0.299	-0.597	0.686	0.035	1.000										
6	-0.339	0.113	0.714	0.739	0.594	1.000									
7	0.556	-0.658	0.104	-0.559	0.706	-0.000	1.000								
8	-0.231	-0.073	0.591	0.486	0.716	0.935	0.306	1.000							
9	0.639	-0.527	-0.103	-0.689	0.441	-0.302	0.936	0.004	1.000						
10	-0.100	-0.171	0.414	0.222	0.718	0.757	0.551	0.937	0.306	1.000					
11	0.689	-0.366	-0.212	-0.704	0.192	-0.530	0.774	-0.277	0.944	0.025	1.000				
12	0.036	-0.186	0.238	0.001	0.626	0.520	0.697	0.774	0.544	0.944	0.309	1.000			
13	0.706	-0.215	-0.232	-0.628	-0.007	-0.664	0.555	-0.502	0.794	-0.250	0.947	0.034	1.000		
14	0.161	-0.144	0.103	-0.145	0.490	0.283	0.742	0.563	0.690	0.803	0.532	0.952	0.297	1.000	
15	0.686	-0.097	-0.182	-0.491	-0.138	-0.699	0.314	-0.644	0.578	-0.479	0.799	-0.240	0.947	0.023	1.000
16	0.269	-0.075	0.024	-0.213	0.347	0.082	0.708	0.346	0.748	0.615	0.677	0.828	0.510	0.957	0.272
17	0.630	-0.025	-0.094	-0.328	-0.195	-0.645	0.093	-0.694	0.337	-0.631	0.587	-0.469	0.804	-0.245	0.950
18	0.357	-0.000	0.000	-0.216	0.221	-0.067	0.616	0.149	0.726	0.407	0.741	0.650	0.657	0.840	0.484
19	0.551	-0.000	-0.000	-0.176	-0.192	-0.533	-0.078	-0.662	0.116	-0.697	0.358	-0.623	0.607	-0.463	0.820
20	0.419	0.063	0.020	-0.169	0.124	-0.157	0.486	-0.011	0.641	0.205	0.727	0.443	0.729	0.664	0.638
21	0.463	-0.011	0.077	-0.061	-0.148	-0.400	-0.186	-0.578	-0.056	-0.689	0.150	-0.700	0.399	-0.614	0.646
22	0.454	0.104	0.068	-0.092	0.065	-0.189	0.344	-0.121	0.512	0.031	0.649	0.235	0.726	0.458	0.719
23	0.377	-0.043	0.127	0.010	-0.086	-0.271	-0.234	-0.468	-0.171	-0.629	-0.017	-0.709	0.205	-0.696	0.457
24	0.463	0.119	0.126	-0.008	0.041	-0.175	0.212	-0.178	0.370	-0.098	0.531	0.054	0.663	0.254	0.731
25	0.297	-0.086	0.146	0.039	-0.021	-0.161	-0.233	-0.349	-0.230	-0.533	-0.134	-0.663	0.042	-0.713	0.271
26	0.454	0.112	0.179	0.065	0.046	-0.130	0.109	-0.190	0.238	-0.177	0.402	-0.083	0.566	0.077	0.690
27	0.225	-0.127	0.137	0.031	0.037	-0.077	-0.193	-0.236	-0.238	-0.417	-0.201	-0.573	-0.083	-0.674	0.103
28	0.435	0.090	0.220	0.119	0.070	-0.072	0.040	-0.168	0.133	-0.210	0.281	-0.173	0.455	-0.059	0.614
29	0.161	-0.159	0.104	-0.004	0.078	-0.024	-0.128	-0.138	-0.205	-0.295	-0.221	-0.456	-0.164	-0.588	-0.035
30	0.410	0.059	0.244	0.149	0.104	-0.012	0.006	-0.126	0.059	-0.206	0.180	-0.217	0.346	-0.152	0.519
31	0.109	-0.176	0.057	-0.052	0.100	-0.001	-0.054	-0.064	-0.145	-0.182	-0.201	-0.328	-0.201	-0.474	-0.133
32	0.383	0.025	0.249	0.156	0.141	0.042	0.001	-0.073	0.017	-0.174	0.104	-0.223	0.247	-0.204	0.417
33	0.369	-0.173	0.007	-0.104	0.103	-0.004	0.016	-0.018	-0.074	-0.090	-0.156	-0.209	-0.202	-0.350	-0.191
34	0.354	-0.007	0.237	0.143	0.173	0.083	0.021	-0.016	0.004	-0.123	0.054	-0.197	0.164	-0.217	0.315
35	0.042	-0.167	-0.039	-0.149	0.091	-0.023	0.073	0.003	-0.004	-0.025	-0.097	-0.109	-0.176	-0.235	-0.212
36	0.296	-0.052	0.173	0.073	0.209	0.120	0.099	0.077	0.046	-0.001	0.029	-0.087	0.061	-0.156	0.143
37	0.014	-0.124	-0.099	-0.204	0.041	-0.086	0.135	-0.012	0.100	0.028	0.018	0.012	-0.084	-0.062	-0.177
38	0.250	-0.061	0.092	-0.012	0.202	0.100	0.183	0.119	0.127	0.096	0.071	0.036	0.039	-0.042	0.047
39	0.008	-0.071	-0.108	-0.204	-0.015	-0.145	0.129	-0.068	0.139	0.002	0.096	0.036	0.014	0.019	-0.086
40	0.223	-0.043	0.030	-0.074	0.168	0.052	0.236	0.115	0.201	0.142	0.138	0.122	0.071	0.063	0.025
41	0.012	-0.027	-0.075	-0.158	-0.056	-0.175	0.074	-0.129	0.116	-0.065	0.119	-0.009	0.082	0.018	0.013
16															
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25															
26															
27															
28															
29															
30															
16	1.000														
17	0.005	1.000													
18	0.959	0.251	1.000												
19	-0.246	0.956	0.000	1.000											
20	0.842	0.465	0.959	0.246	1.000										
21	-0.451	0.844	-0.233	0.963	0.913	1.000									
22	0.670	0.624	0.845	0.459	0.961	0.254	1.000								
23	-0.557	0.688	-0.428	0.863	-0.207	0.966	0.034	1.000							
24	0.473	0.714	0.684	0.616	0.856	0.457	0.965	0.261	1.000						

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MATRIX OF CORRELATIONS
VARIABLE 1 IS THE DEPENDENT VARIABLE, ALL OTHERS ARE COSINE AND SINE WAVES OF VARIOUS PERIODS

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	1.000														
2	-0.221	1.000													
3	-0.047	0.028	1.000												
4	-0.306	0.892	0.415	1.000											
5	-0.017	-0.376	0.880	0.010	1.000										
6	-0.389	0.627	0.664	0.901	0.381	1.000									
7	0.056	-0.637	0.590	-0.373	0.893	0.000	1.000								
8	-0.445	0.298	0.731	0.641	0.642	0.902	0.371	1.000							
9	0.165	-0.714	0.267	-0.623	0.644	-0.352	0.911	0.021	1.000						
10	-0.453	0.012	0.637	0.320	0.733	0.658	0.631	0.912	0.373	1.000					
11	0.299	-0.640	0.003	-0.713	0.346	-0.597	0.686	-0.318	0.918	0.035	1.000				
12	-0.414	-0.163	0.465	0.047	0.681	0.370	0.739	0.701	0.619	0.926	0.358	1.000			
13	0.438	-0.467	-0.158	-0.651	0.070	-0.698	0.390	-0.571	0.697	-0.303	0.918	0.020	1.000		
14	-0.339	-0.221	0.286	-0.131	0.543	0.113	0.714	0.441	0.733	0.739	0.594	0.934	0.327	1.000	
15	0.555	-0.263	-0.207	-0.488	-0.123	-0.658	0.104	-0.691	0.406	-0.559	0.706	-0.307	0.924	-0.000	1.000
16	-0.231	-0.185	0.143	-0.204	0.370	-0.073	0.591	0.183	0.720	0.486	0.716	0.753	0.567	0.935	0.306
17	0.639	-0.097	-0.169	-0.299	-0.211	-0.527	-0.103	-0.682	0.134	-0.689	0.441	-0.549	0.737	-0.302	0.934
18	-0.100	-0.092	0.057	-0.185	0.205	-0.171	0.414	-0.025	0.605	0.222	0.718	0.501	0.703	0.757	0.551
19	0.689	0.001	-0.089	-0.139	-0.211	-0.366	-0.212	-0.587	-0.068	-0.704	0.192	-0.682	0.502	-0.530	0.774
20	0.036	0.013	0.031	-0.110	0.084	-0.186	0.238	-0.154	0.440	0.001	0.626	0.243	0.728	0.520	0.697
21	0.706	0.031	-0.002	-0.035	-0.152	-0.215	-0.232	-0.444	-0.185	-0.628	-0.007	-0.707	0.264	-0.664	0.555
22	0.161	0.096	0.050	-0.018	0.022	-0.144	0.103	-0.204	0.276	-0.145	0.490	0.030	0.669	0.283	0.742
23	0.686	0.005	0.067	0.010	-0.063	-0.097	-0.182	-0.288	-0.218	-0.491	-0.138	-0.640	0.255	-0.699	0.314
24	0.269	0.144	0.094	0.062	0.013	-0.075	0.024	-0.191	0.146	-0.213	0.347	-0.118	0.560	0.082	0.708
25	0.630	-0.053	0.105	0.003	0.024	-0.025	-0.094	-0.148	-0.185	-0.328	-0.195	-0.509	-0.099	-0.645	0.093
26	0.357	0.153	0.145	0.116	0.042	-0.000	0.000	-0.136	0.062	-0.216	0.221	-0.195	0.429	-0.067	0.616
27	0.551	-0.118	0.109	-0.038	0.090	-0.000	-0.000	-0.046	-0.113	-0.176	-0.192	-0.354	-0.187	-0.533	-0.078
28	0.419	0.128	0.188	0.137	0.093	0.063	0.020	-0.060	0.025	-0.169	0.124	-0.209	0.296	-0.157	0.486
29	0.463	-0.172	0.088	-0.091	0.125	-0.011	0.077	0.019	-0.031	-0.061	-0.148	-0.210	-0.215	-0.400	-0.186
30	0.454	0.080	0.212	0.126	0.148	0.104	0.068	0.018	0.029	-0.092	0.065	-0.173	0.179	-0.189	0.344
31	0.377	-0.206	0.052	-0.142	0.131	-0.043	0.127	0.024	0.041	0.010	-0.086	-0.096	-0.197	-0.271	-0.234
32	0.463	0.024	0.215	0.093	0.194	0.119	0.126	0.081	0.060	-0.008	0.041	-0.107	0.093	-0.175	0.212
33	0.297	-0.217	0.011	-0.180	0.111	-0.086	0.146	0.007	0.094	0.039	-0.021	-0.020	-0.150	-0.161	-0.233
34	0.454	-0.028	0.201	0.048	0.223	0.112	0.179	0.122	0.105	0.065	0.046	-0.032	0.041	-0.130	0.109
35	0.225	-0.204	-0.028	-0.199	0.074	-0.127	0.137	-0.031	0.122	0.031	0.037	0.018	-0.086	-0.077	-0.193
36	0.435	-0.068	0.176	0.004	0.234	0.090	0.220	0.139	0.151	0.119	0.070	0.037	0.021	-0.072	0.040
37	0.161	-0.172	-0.058	-0.197	0.029	-0.159	0.104	-0.078	0.124	-0.004	0.078	0.021	-0.019	-0.024	-0.128
38	0.410	-0.092	0.145	-0.035	0.228	0.059	0.244	0.136	0.191	0.149	0.104	0.092	0.028	-0.012	0.006
39	0.109	-0.127	-0.075	-0.177	-0.017	-0.176	0.057	-0.124	0.104	-0.052	0.100	-0.002	0.040	-0.001	-0.054
40	0.383	-0.099	0.113	-0.063	0.209	0.025	0.249	0.115	0.219	0.156	0.141	0.128	0.053	0.042	0.001
41	0.069	-0.080	-0.079	-0.144	-0.055	-0.178	0.007	-0.161	0.071	-0.104	0.103	-0.040	0.084	-0.004	0.016
16															
17															
18															
19															
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21															
22															
23															
24															
25															
26															
27															
28															
29															
30															
16	1.000														
17	0.004	1.000													
18	0.937	0.306	1.000												
19	-0.277	0.944	0.025	1.000											
20	0.774	0.944	0.944	0.309	1.000										
21	-0.552	0.794	-0.250	0.947	0.034	1.000									
22	0.563	0.690	0.803	0.532	0.952	0.297	1.000								
23	-0.644	0.378	-0.479	0.799	-0.240	0.947	0.023	1.000							
24	0.346	0.748	0.619	0.677	0.628	0.910	0.957	0.272	1.000						

C-2

19.000	0.573	2.294	1.363
19.500	0.716	3.185	1.514
20.000	0.996	4.220	-1.429
20.500	1.202	5.191	-1.202
21.000	1.374	5.906	-0.987
21.500	1.527	6.603	-0.758
22.000	1.648	7.517	-0.547
22.500	1.720	8.547	-0.346
23.000	1.762	9.454	-0.144
23.500	1.789	9.858	0.051
24.000	1.784	9.467	0.230
24.500	1.735	8.497	0.403
25.000	1.662	7.549	0.575
25.500	1.583	6.907	0.736
26.000	1.495	6.461	0.877
26.500	1.394	6.026	1.000
27.000	1.284	5.543	1.112
27.500	1.175	5.048	1.216
28.000	1.075	4.583	1.311
28.500	0.985	4.157	1.391

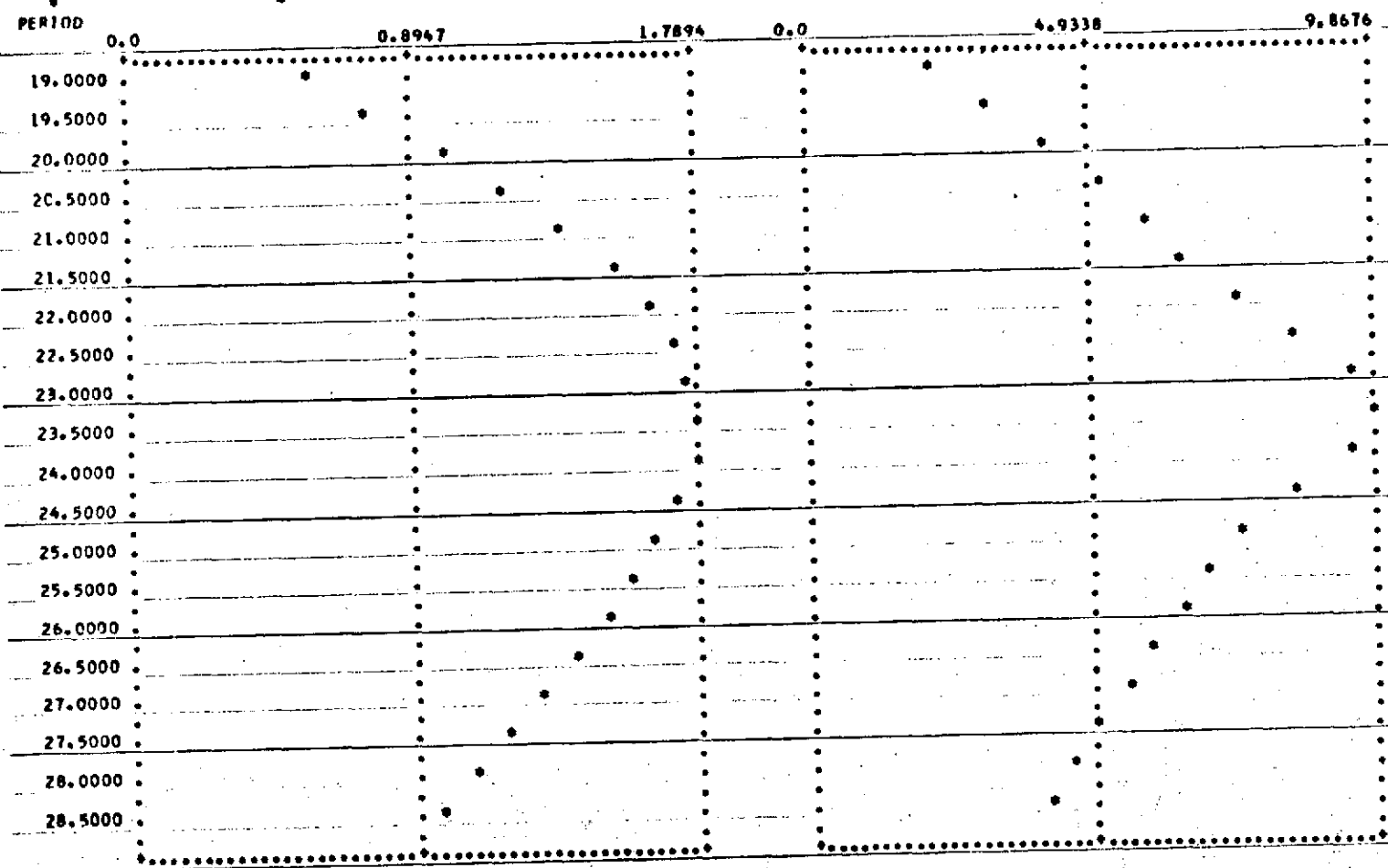
PERIOD		AMPLITUDE		T-VALUE		PHASE		S I N G L E B A N D S P E C T R U M																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
31	32	33	34	35	36	37	38	39	40	41																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
1.000	0.261	0.966	0.045	1.000	0.256	1.000	0.968	0.040	1.000	0.238	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.024	1.000	0.968	0.0

.....

..... AMPLITUDE ESTIMATE.

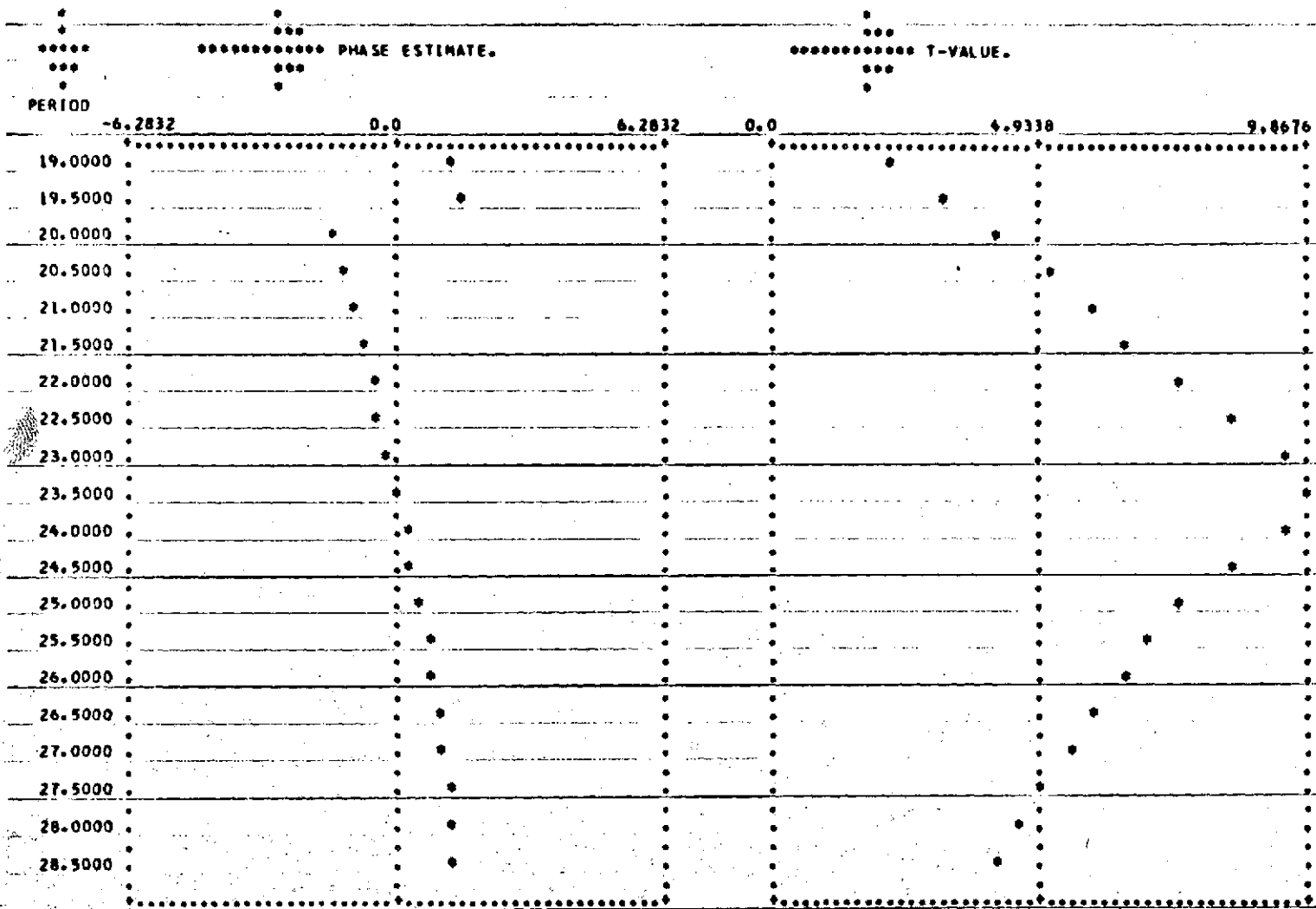
.....

..... T-VALUE.



IA

ORIGINAL PAGE IS
OF POOR QUALITY



DETERMINANT = 0.998839259147644E 00

MULTIPLE SQUARED CORRELATION= 0.4982

PERIOD/FREQ.	AMPLITUDE	T-VALUE
23.5000	1.7894	9.8676

DETERMINANT = 0.999392986297607E 00

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OF POOR QUALITY

MULTIPLE SQUARED CORRELATION=	0.4878	T-VALUE
PERIOD/FREQ.	AMPLITUDE	
23.0000	1.7620	9.4542

DETERMINANT = 0.999486804008484E 00

MULTIPLE SQUARED CORRELATION=	0.4915	T-VALUE
PERIOD/FREQ.	AMPLITUDE	
24.0000	1.7838	9.4675

VIII

ORIGINAL PAGE IS
OF POOR QUALITY

COMPUTING SPECTRUM USING THE FOLLOWING BANDS IN MODEL
23.5000

DETERMINANT = 0.10451063913755BE-01

MULTIPLE SQUARED CORRELATION= 0.6675

PERIOD/FREQ.	AMPLITUDE	T-VALUE
23.0000	6.3633	10.9500
24.0000	6.6188	12.6390

DETERMINANT = 0.518697053194046E-01

MULTIPLE SQUARED CORRELATION= 0.6676

PERIOD/FREQ.	AMPLITUDE	T-VALUE
22.5000	3.1382	13.9762
24.0000	6.6188	12.6390

DETERMINANT = 0.152032911777496E 00

MULTIPLE SQUARED CORRELATION= 0.6648

PERIOD/FREQ.	AMPLITUDE	T-VALUE
22.0000	2.0742	9.8360
24.0000	6.6188	12.6390

DETERMINANT = 0.124989524483681E-01

MULTIPLE SQUARED CORRELATION= 0.6654

PERIOD/FREQ.	AMPLITUDE	T-VALUE
22.5000	3.1382	13.9762
23.5000	1.7870	22.0729

DETERMINANT = 0.130248904228210E 00

MULTIPLE SQUARED CORRELATION= 0.6680

PERIOD/FREQ.	AMPLITUDE	T-VALUE
22.5000	3.1382	13.9762
24.5000	3.3890	13.4829

DETERMINANT = 0.246585547924042E 00

MULTIPLE SQUARED CORRELATION= 0.6666

PERIOD/FREQ.	AMPLITUDE	T-VALUE
22.5000	3.1382	13.9762
25.0000	2.3185	12.0589

COMPUTING SPECTRUM USING THE FOLLOWING BANDS IN MODEL

22.5000
24.5000

M U L T I P L E B A N D S P E C T R U M

PERIOD AMPLITUDE T-VALUE PHASE

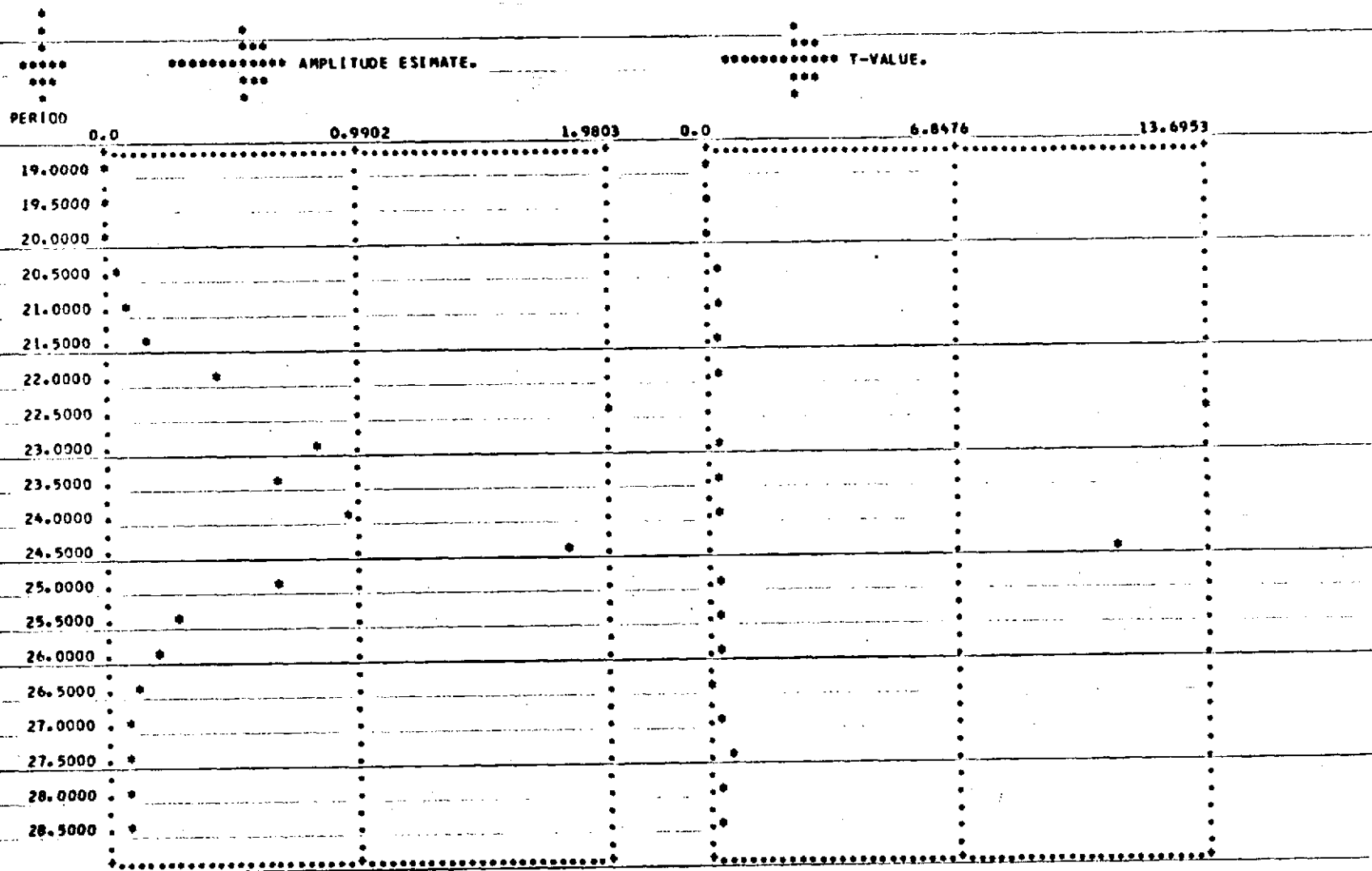
19.000	0.017	0.128	1.090
19.500	0.021	0.202	-1.152
20.000	0.032	0.178	-0.436
20.500	0.051	0.299	0.144
21.000	0.086	0.317	0.643
21.500	0.167	0.346	1.093
22.000	0.438	0.418	1.510
22.500	1.980	13.695	0.433
23.000	0.851	0.381	-0.874
23.500	0.681	0.436	-0.512
24.000	0.979	0.414	-0.159
24.500	1.839	11.277	-0.544
25.000	0.691	0.362	0.508
25.500	0.313	0.483	0.836
26.000	0.197	0.402	1.156
26.500	0.144	0.146	1.470
27.000	0.115	0.413	-1.368
27.500	0.098	0.545	-1.076
28.000	0.088	0.536	-0.797
28.500	0.082	0.396	-0.531

X

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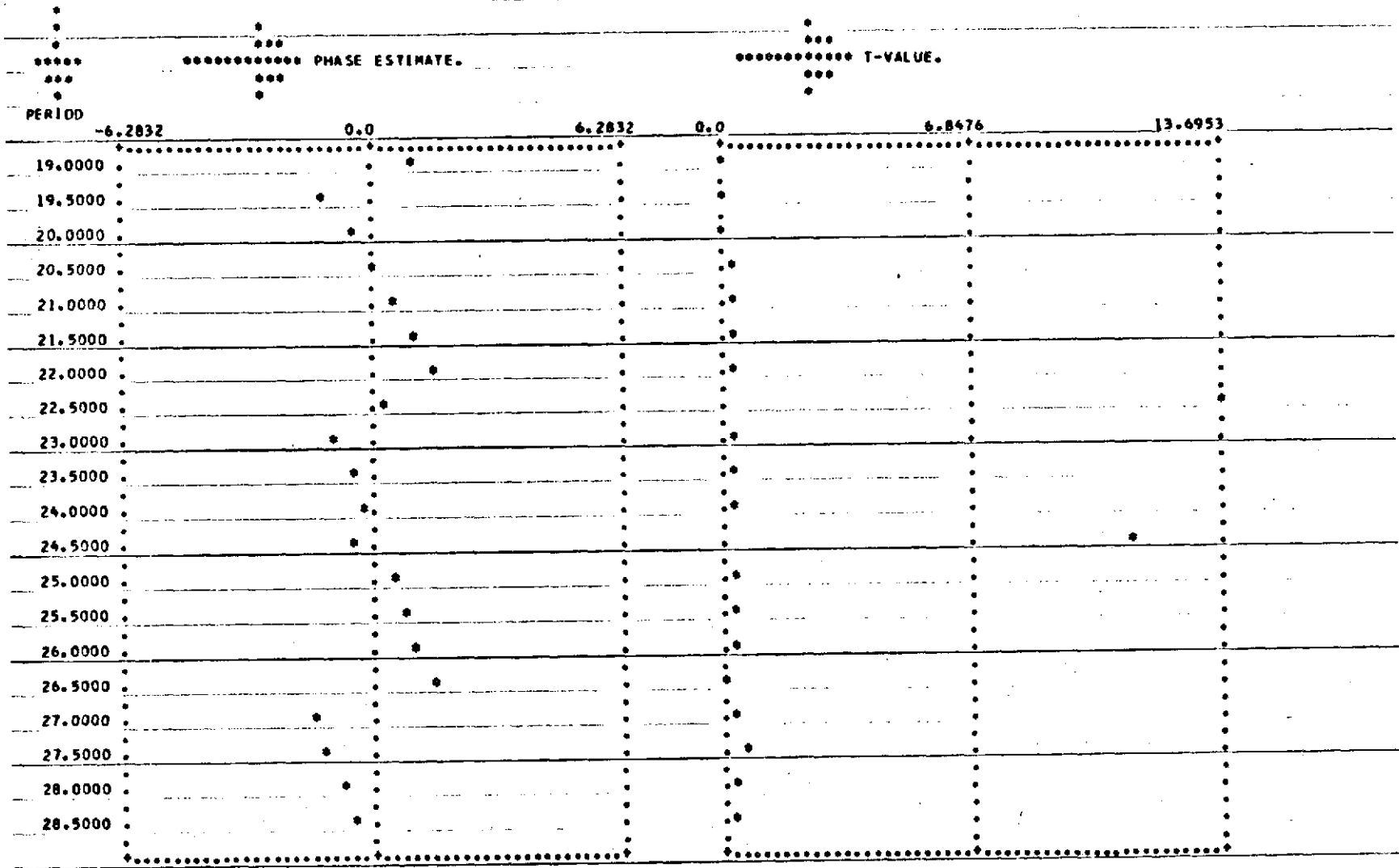
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OF FOUR QUARTERS

xi



ORIGINAL PAGE IS
OF POOR QUALITY

xix



MULTIPLE SQUARED CORRELATION= 0.6684

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OF POOR QUALITY

T E S T 2.

THE FOLLOWING IS A LISTING OF THE CONTROL AND DATA CARDS FOR TEST 2.
OUTPUT FOLLOWS.

0	1	20	100	0	1	0	3	2				
20.0		21.0		22.0		22.5		23.0	23.5	24.0	24.5	
25.0		25.5		26.0		26.5		27.0	27.5	28.0	28.5	
29.0		30.0		31.0		32.0						
2												
22.0	1.0											
25.0	1.0											
1.0												
1	-3180	-7990	-13340	13910	3920	7330	6530	2190	-6810	11290		
2	-13770	-12570	4950	-1390	-8540	4280	-13220	-3150	-7320	-13480		
3	23340	-3370	-19550	-6360	-13180	-4330	5450	4280	-2970	2760		
4	-11360	6420	34360	-16670	5470	-11730	-3550	350	3590	9300		
5	4140	-110	6660	-11320	-4100	-10770	7340	14840	-3400	7890		
6	-4940	3640	-12370	-440	-1110	-2100	9310	6160	-1770	-4330		
7	10480	370	7590	6090	-20430	-2900	4040	-5430	4860	8690		
8	3470	28160	-4640	-6320	-16140	3720	-740	-9160	13140	-380		
9	6370	5630	-1070	1310	-18080	-11260	3790	6100	-3640	-26260		
10	21760	3930	-9240	19110	-10400	-11680	4850	760	-7690	16070		

SIPR

ORIGINAL PAGE IS
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***** PROGRAM PARAMETERS *****
0 1 20 100 0 1 0 3 2

MONTE CARLO SIMULATED DATA

BAND 1 PERIOD= 22.0000, FREQUENCY= 0.0455, AMPLITUDE= 1.0000
BAND 2 PERIOD= 25.0000, FREQUENCY= 0.0400, AMPLITUDE= 1.0000

RANDOM GAUSSIAN NOISE AMPLITUDE= 1.0000

STPR TIME---1:14.4

xiv

ORIGINAL PAGE IS
OF POOR QUALITY

25	-0.643	0.510	-0.574	0.718	-0.399	0.873	-0.182	0.969	0.045	1.000										
26	0.781	0.747	0.521	0.711	0.711	0.608	0.871	0.451	0.770	0.256	1.000									
27	-0.706	0.324	-0.666	0.542	-0.550	0.730	-0.377	0.875	-0.171	0.949	0.043	1.000								
28	0.115	0.719	0.328	0.749	0.549	0.704	0.745	0.595	0.889	0.415	0.973	0.238	1.000							
29	-0.673	0.148	-0.676	0.353	-0.648	0.554	-0.537	0.733	-0.366	0.876	-0.174	0.968	0.024	1.000						
30	-0.018	0.660	0.170	0.738	0.335	0.747	0.596	0.691	0.773	0.576	0.909	0.412	0.975	0.214	1.000					
31	-0.556	-0.002	-0.674	0.173	-0.690	0.367	-0.617	0.561	-0.573	0.739	-0.366	0.880	-0.185	0.970	0.006					
32	-0.114	0.574	0.037	0.688	0.230	0.744	0.438	0.737	0.617	0.674	0.789	0.553	0.905	0.387	0.976					
33	-0.492	-0.114	-0.611	0.019	-0.692	0.191	-0.649	0.383	-0.630	0.577	-0.517	0.753	-0.366	0.890	-0.170					
34	-0.173	0.473	-0.066	0.617	0.097	0.699	0.281	0.740	0.473	0.726	0.648	0.655	0.795	0.531	0.906					
35	-0.382	-0.187	-0.525	-0.099	-0.637	0.041	-0.675	0.217	-0.689	0.412	-0.623	0.607	-0.510	0.777	-0.360					
36	-0.189	0.261	-0.175	0.394	-0.106	0.521	0.011	0.628	0.162	0.707	0.330	0.731	0.499	0.706	0.660					
37	-0.184	-0.230	-0.334	-0.225	-0.486	-0.159	-0.611	-0.040	-0.688	0.122	-0.709	0.312	-0.678	0.506	-0.599					
38	-0.118	0.100	-0.172	0.192	-0.188	0.310	-0.154	0.439	-0.072	0.564	0.050	0.666	0.199	0.727	0.365					
39	-0.052	-0.175	-0.168	-0.227	-0.309	-0.730	-0.452	-0.180	-0.572	-0.080	-0.656	0.062	-0.697	0.233	-0.695					
40	-0.021	0.018	-0.109	0.059	-0.179	0.143	-0.211	0.260	-0.196	0.396	-0.133	0.532	-0.028	0.647	0.110					
41	0.003	-0.071	-0.055	-0.146	-0.150	-0.196	-0.269	-0.210	-0.393	-0.181	-0.505	-0.108	-0.597	0.005	-0.659					
11	32	33	34	35	36	37	38	39	40	41										

31	1.000																			
32	0.155	1.000																		
33	0.974	-0.022	1.000																	
34	0.369	0.376	0.187	1.000																
35	0.903	-0.185	0.977	0.003	1.000															
36	0.628	0.801	0.538	0.910	0.361	1.000														
37	0.682	-0.478	0.823	-0.324	0.923	0.033	1.000													
38	0.737	0.534	0.697	0.694	0.614	0.926	0.360	1.000												
39	0.411	-0.649	0.579	-0.560	0.724	-0.283	0.928	0.042	1.000											
40	0.723	0.272	0.754	0.442	0.738	0.751	0.594	0.941	0.335	1.000										
41	0.146	-0.687	0.300	-0.675	0.455	-0.529	0.734	-0.272	0.930	0.019	1.000									

S I N G L E B A N D S P E C T R U M

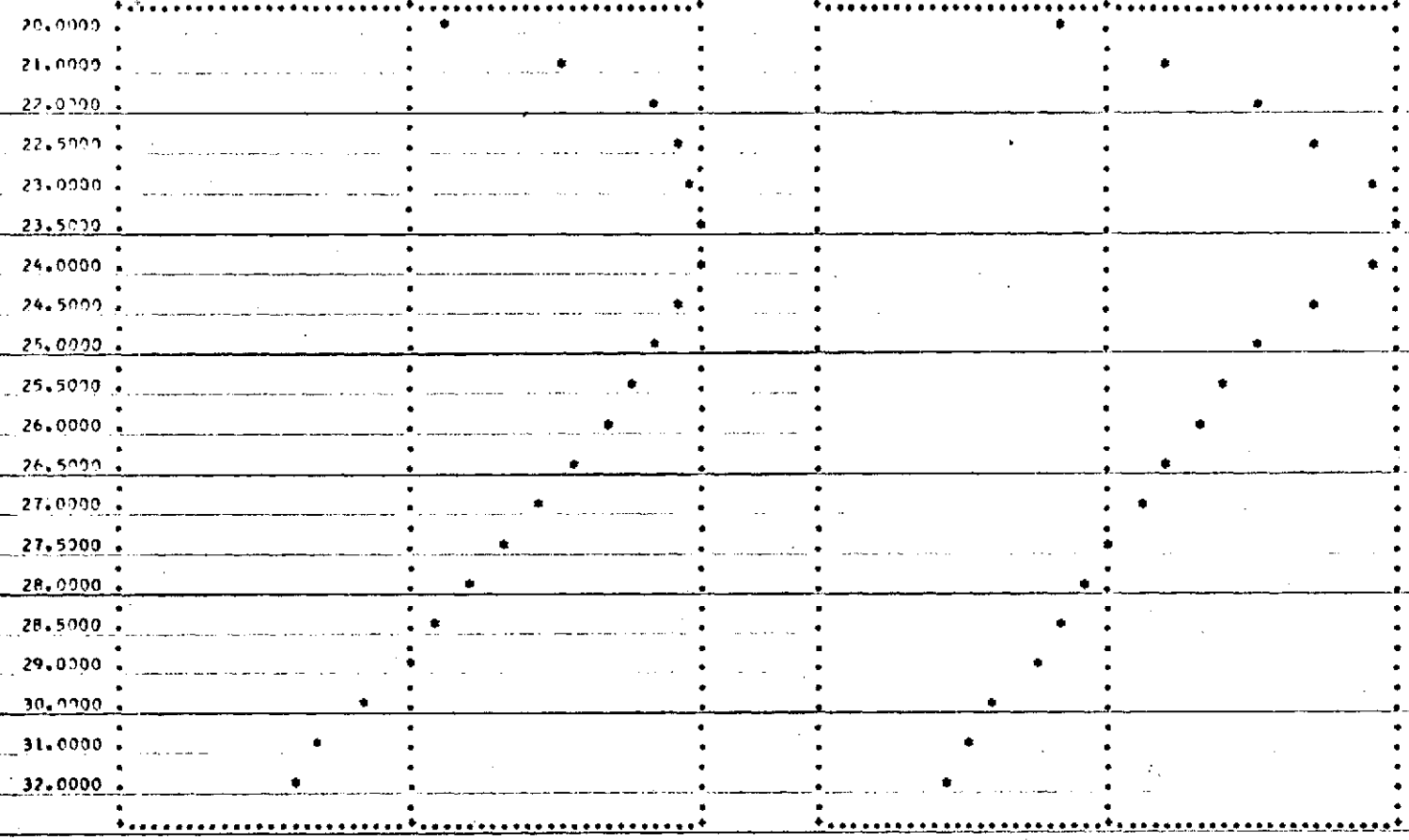
PERIOD	AMPLITUDE	T-VALUE	PHASE
20.000	0.396	4.220	-1.429
21.000	1.374	5.906	-0.987
22.000	1.643	7.517	-0.547
22.500	1.720	8.547	-0.346
23.000	1.762	9.454	-0.144
23.500	1.789	9.868	0.051
24.000	1.784	9.467	0.230
24.500	1.735	8.497	0.403
25.000	1.662	7.549	0.575
25.500	1.583	6.907	0.736
26.000	1.495	6.461	0.877
26.500	1.394	6.076	1.000
27.000	1.284	5.543	1.112
27.500	1.175	5.048	1.216
28.000	1.075	4.583	1.311
28.500	0.935	4.157	1.391
29.000	0.901	3.764	1.454
30.000	0.750	3.068	1.525
31.000	0.632	2.553	1.538
32.000	0.565	2.247	1.516

***** AMPLITUDE ESTIMATE.

***** T-VALUE.

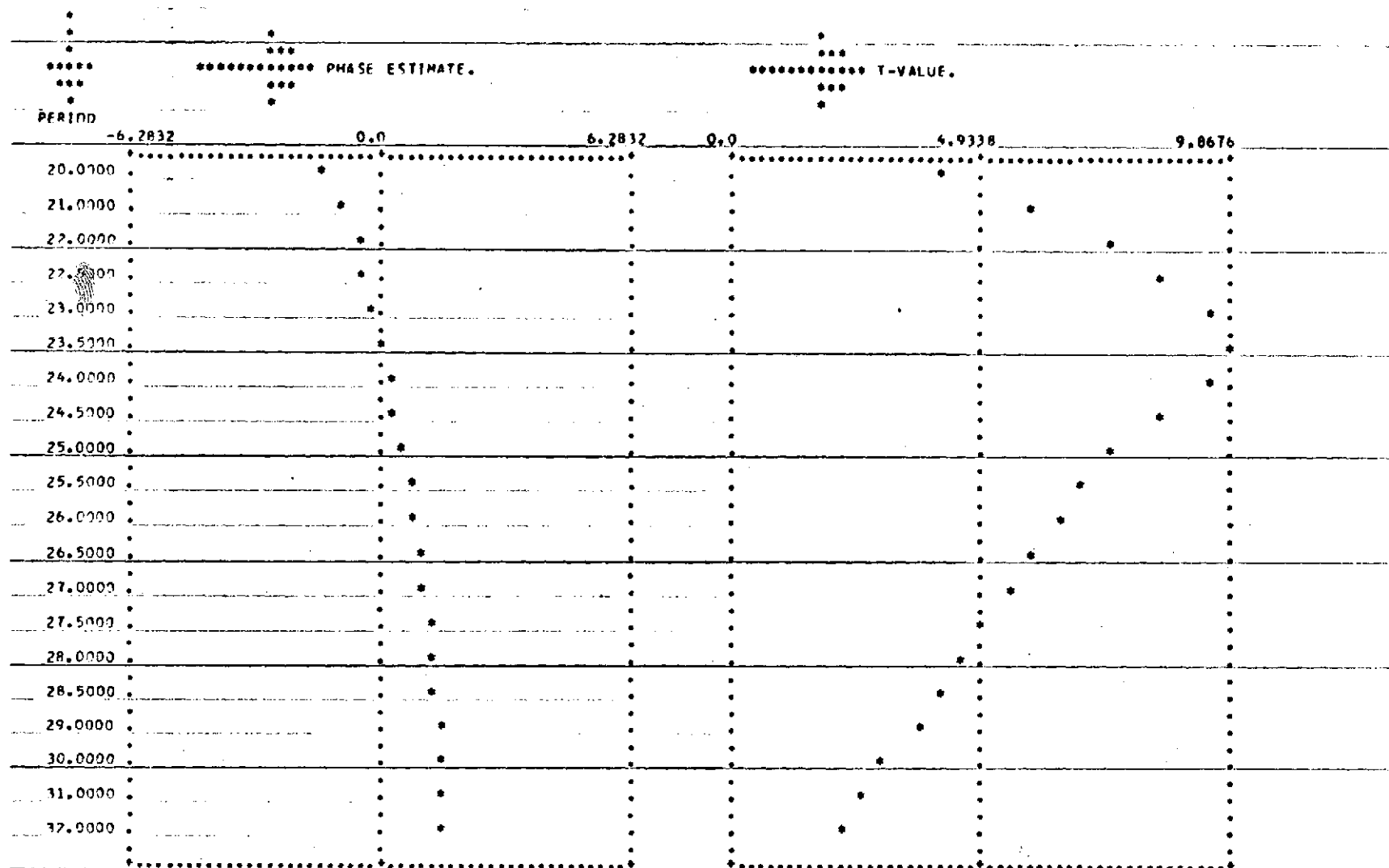
PERIOD

0.0 0.8747 1.7894 0.0 4.9338 9.8676



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DETERMINANT = 0.998819259147644E 00

MULTIPLE SQUARE CORRELATION= 0.4982

PERIOD/FREQ.	AMPLITUDE	T-VALUE
23.5000	1.7894	9.8676

DETERMINANT = 0.999392986297607E 00

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MULTIPLE SQUARED CORRELATION= 0.4878
PERIOD/FREQ. AMPLITUDE T-VALUE
23.0000 1.7629 9.4542

DETERMINANT = 0.999486804008484E 00

MULTIPLE SQUARED CORRELATION= 0.4915
PERIOD/FREQ. AMPLITUDE T-VALUE
24.0000 1.7838 9.4675

xviii

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COMPUTING SPECTRUM USING THE FOLLOWING BANDS IN MODEL
23.5000

DETERMINANT = 0.104510635117558E-01

MULTIPLE SQUARED CORRELATION= 0.6675

PERIOD/FREQ.	AMPLITUDE	T-VALUE
23.0000	6.3633	10.9500
24.0000	6.6188	12.6390

DETERMINANT = 0.518697053194046E-01

MULTIPLE SQUARED CORRELATION= 0.6676

PERIOD/FREQ.	AMPLITUDE	T-VALUE
22.5000	1.6127	10.3411
24.0000	6.6188	12.6390

DETERMINANT = 0.152032911777496E 00

MULTIPLE SQUARED CORRELATION= 0.6648

PERIOD/FREQ.	AMPLITUDE	T-VALUE
22.0000	-0.9963	-7.6555
24.0000	6.6188	12.6390

DETERMINANT = 0.124989524483681E-01

MULTIPLE SQUARED CORRELATION= 0.6654

PERIOD/FREQ.	AMPLITUDE	T-VALUE
22.5000	1.5877	8.0414
23.5000	1.7870	22.0729

DETERMINANT = 0.130248904228210E 00

MULTIPLE SQUARED CORRELATION= 0.6680

PERIOD/FREQ.	AMPLITUDE	T-VALUE
22.5000	1.5738	7.7647
24.5000	3.3890	13.4829

DETERMINANT = 0.246585547224042E 00

MULTIPLE SQUARED CORRELATION= 0.6666

PERIOD/FREQ.	AMPLITUDE	T-VALUE
27.5000	1.4935	8.5166
25.0000	2.3185	12.0589

COMPUTING SPECTRUM USING THE FOLLOWING BANDS IN MODEL

22.5000

24.5000

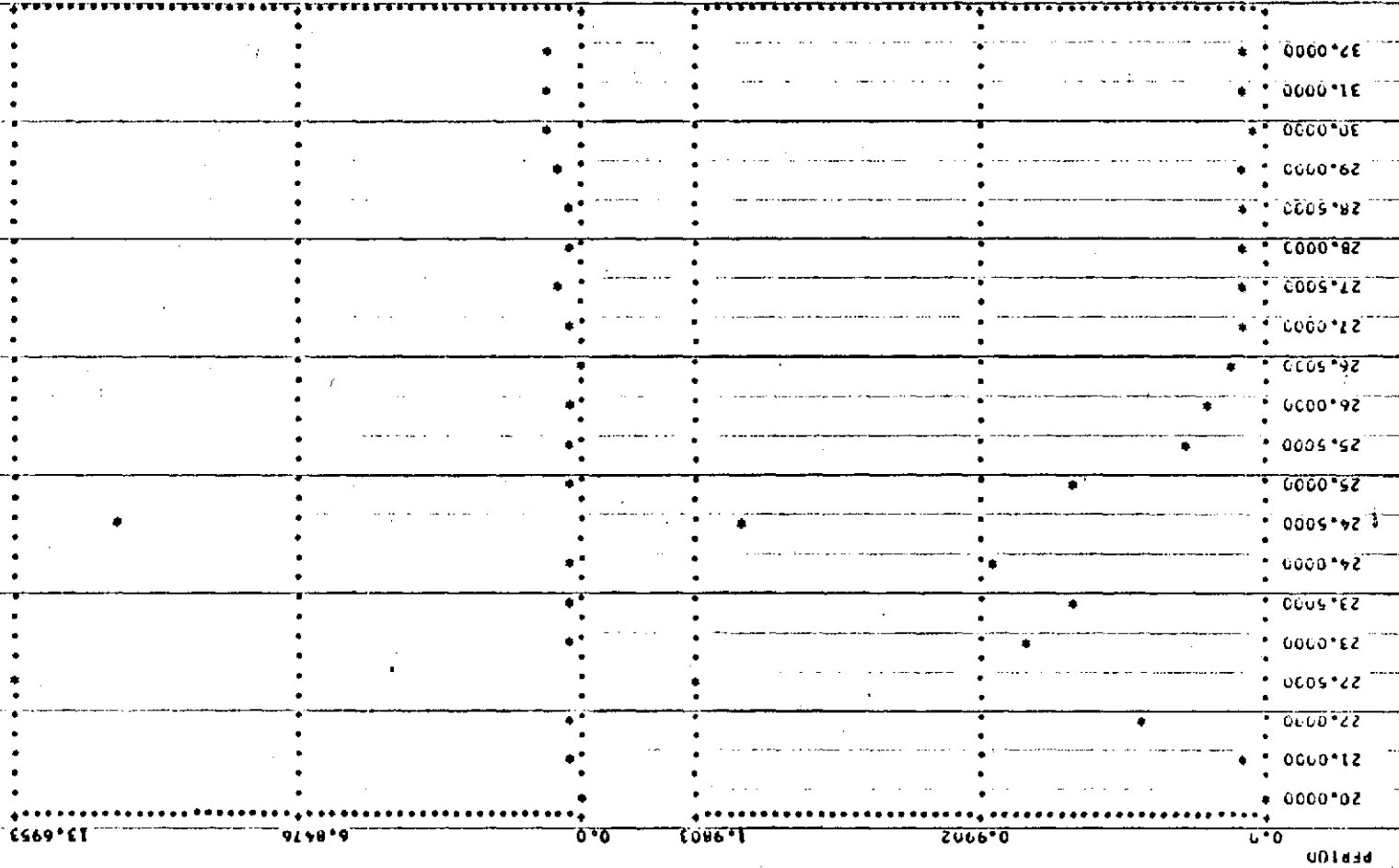
M U L T I P L E B A N D S P E C T R U M

PERIOD	AMPLITUDE	T-VALUE	PHASE
20.000	0.732	0.178	-0.436
21.000	0.984	0.317	0.643
22.000	0.438	0.413	1.510
22.500	1.980	13.695	0.433
23.000	0.851	0.381	-0.874
23.500	0.581	0.435	-0.512
24.000	0.779	0.414	-0.159
24.500	1.839	11.277	-0.544
25.000	0.691	0.362	0.508
25.500	0.313	0.493	0.836
26.000	0.197	0.402	1.156
26.500	0.144	0.146	1.470
27.000	0.115	0.413	-1.368
27.500	0.098	0.545	-1.076
28.000	0.088	0.536	-0.797
28.500	0.082	0.396	-0.531
29.000	0.079	0.553	-0.279
30.000	0.077	0.854	0.181
31.000	0.080	0.895	0.590
32.000	0.086	1.014	0.954

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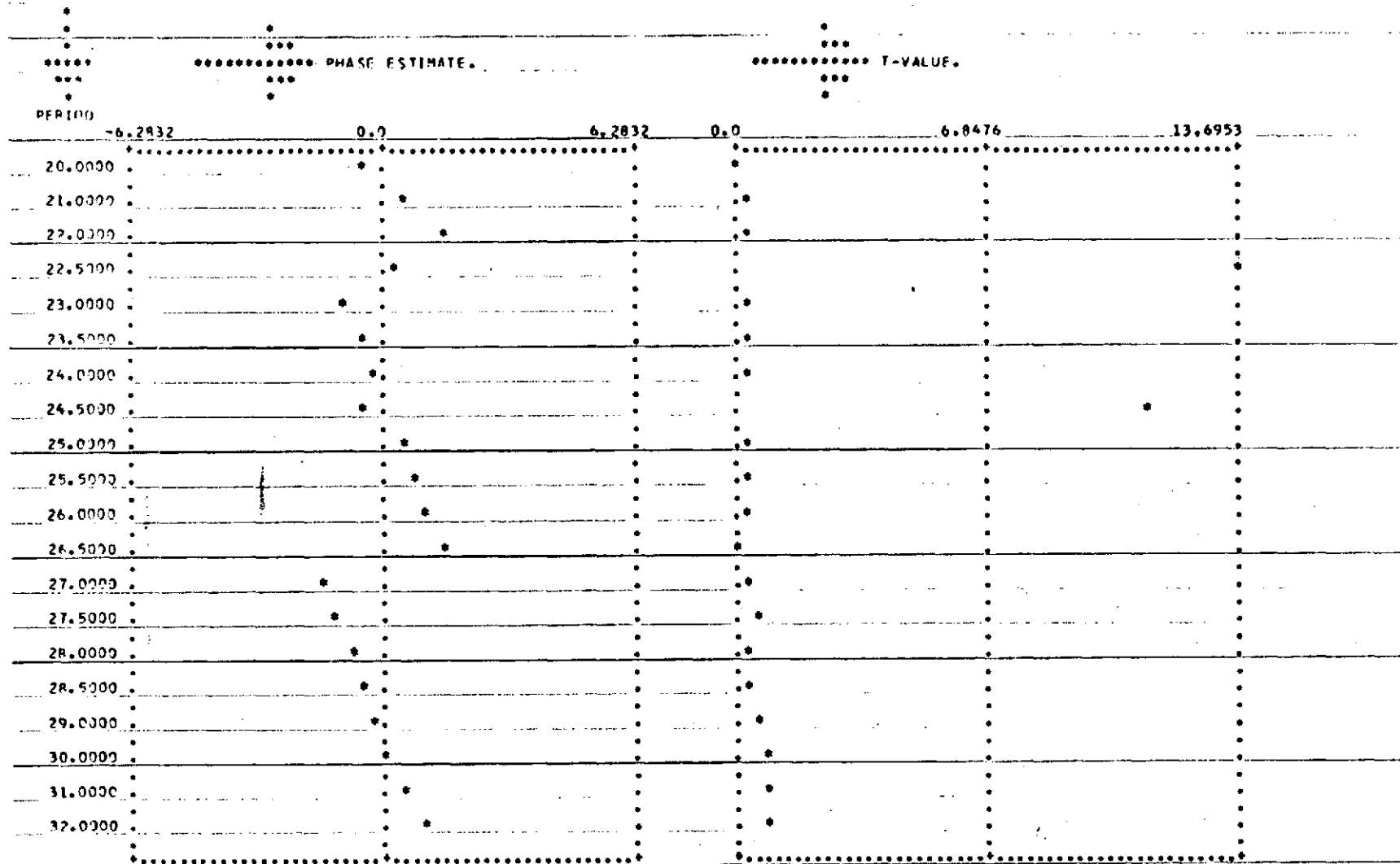


T-VALUE

AMPLITUDE ESTIMATE

PFR100

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MULTIPLE SQUARED CORRELATION= 0.6490

xx11

TEST 3.

THE FOLLOWING IS A LISTING OF THE CONTROL AND DATA CARDS FOR TEST 3.
OUTPUT FOLLOWS.

1	0	20	100	0	1	0	1	2
0.035		0.001						
2								
0.045	1.0							
0.040	1.0							
0.5								
1	-3180	-7990	-13340	13910	3820	7330	6530	2190 -6810 11290
2	-13770	-12570	8950	-1390	-8540	4280	-13220	-3150 -7120 -13480
3	23340	-3370	-19550	-6360	-13180	-4330	5450	4280 -2970 2760
4	-11360	6420	30360	-16670	5470	-11730	-3550	350 3590 9300
5	4140	-110	6660	-11320	-4100	-10770	7140	14840 -1400 7890
6	-4940	3640	-12370	-440	-1110	-2100	9330	6160 -3770 -4330
7	10480	370	7590	6090	-20430	-2900	4040	-5430 4860 8690
8	3470	28160	-4640	-6320	-16140	3720	-740	-9160 13140 -380
9	6370	5630	-1070	1310	-18080	-11260	3790	6100 -3640 -26260
10	21760	3930	-9240	19110	-10400	-11680	4850	760 -7690 16070

SOPE

xxxx

***** PROGRAM PARAMETERS *****
1 0 20 100 0 1 0 3 2

M O N T E C A R L O SIMULATED DATA

BAND 1 ~ PERIOD= 22.2222, FREQUENCY= 0.0450, AMPLITUDE= 1.0000
BAND 2 ~ PERIOD= 25.0000, FREQUENCY= 0.0400, AMPLITUDE= 1.0000

RANDOM GAUSSIAN NOISE AMPLITUDE= 0.5000

SOPR TIME---1:12.6

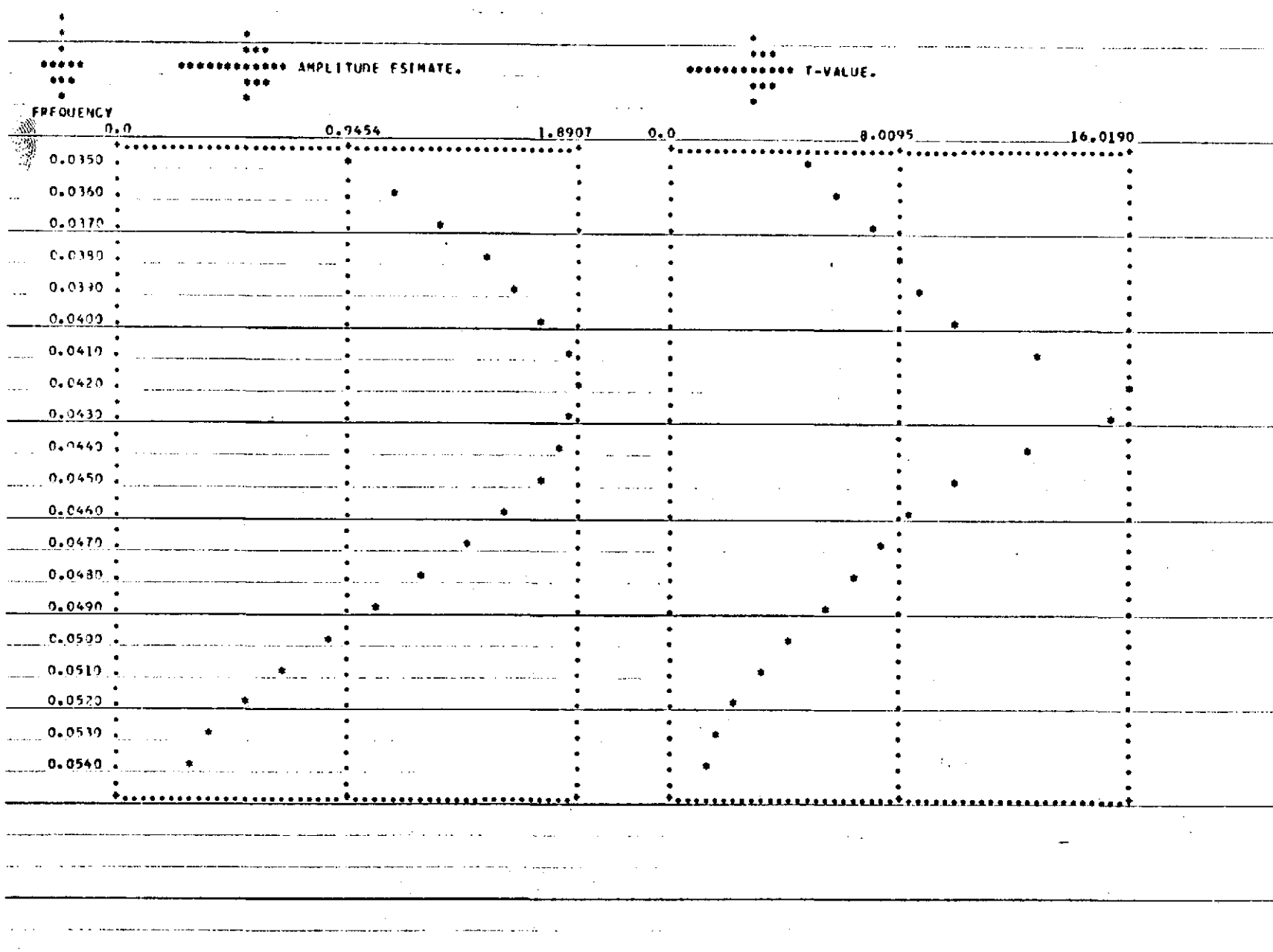
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MATRIX OF CORRELATIONS
VARIABLE 1 IS THE DEPENDENT VARIABLE, ALL OTHERS ARE COSINE AND SINE WAVES OF VARIOUS PERIODS

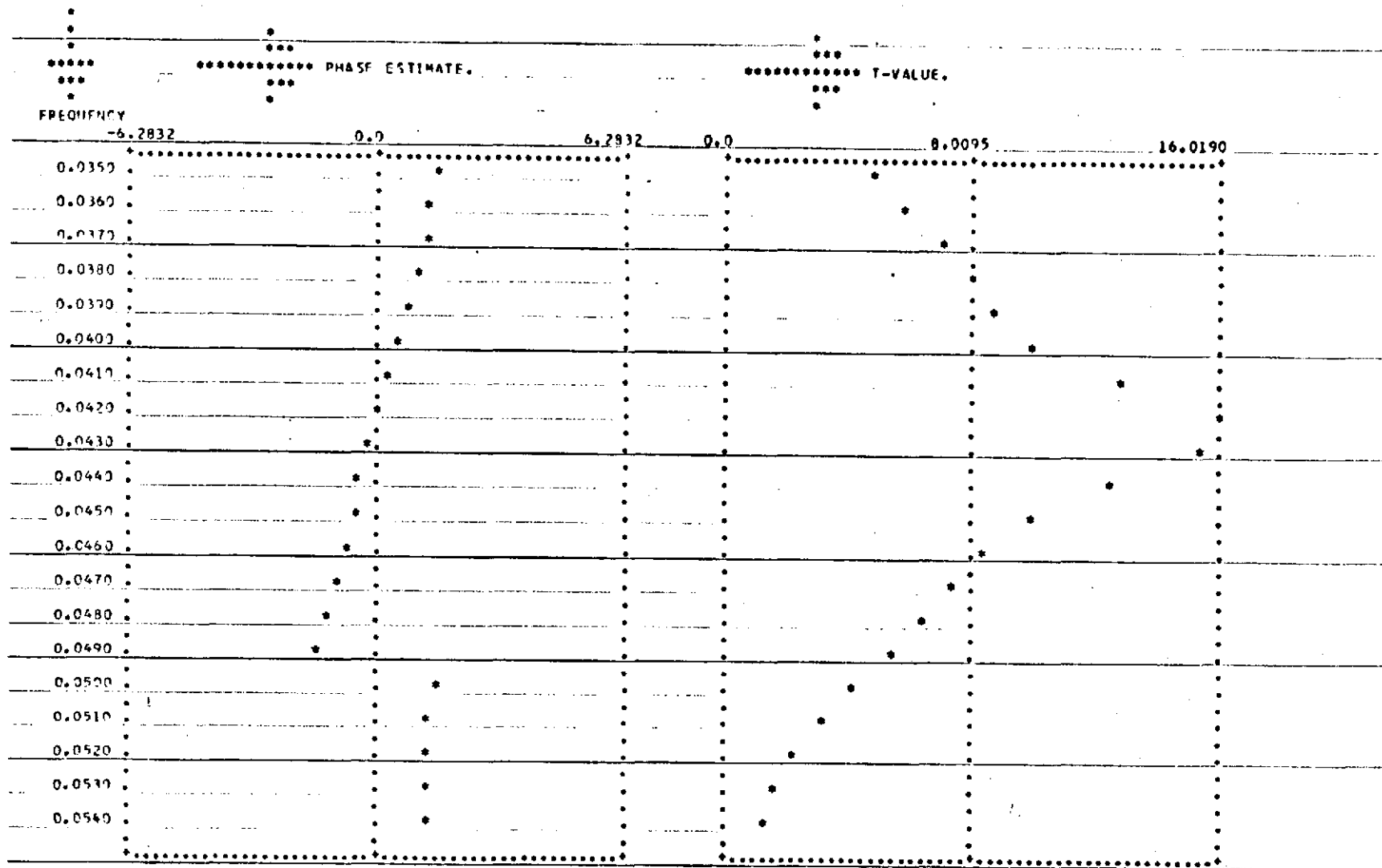
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	1.000														
2	-0.142	1.000													
3	-0.022	0.012	1.000												
4	-0.179	0.934	0.320	1.000											
5	-0.046	-0.201	0.939	0.027	1.000										
6	-0.237	0.758	0.565	0.938	0.326	1.000									
7	-0.059	-0.525	0.761	-0.276	0.935	0.023	1.000								
8	-0.314	0.119	0.709	0.771	0.564	0.941	0.315	1.000							
9	-0.147	-0.670	0.504	-0.527	0.750	-0.287	0.932	0.006	1.000						
10	-0.403	0.262	0.739	0.532	0.705	0.772	0.556	0.938	0.304	1.000					
11	-0.001	-0.497	0.225	-0.676	0.491	-0.535	0.749	-0.299	0.935	0.000	1.000				
12	-0.405	0.032	0.655	0.764	0.729	0.571	0.701	0.759	0.554	0.934	0.109	1.000			
13	-0.083	-0.622	-0.012	-0.708	0.223	-0.691	0.503	-0.538	0.763	-0.293	0.939	0.016	1.000		
14	-0.536	-0.128	0.491	0.022	0.640	0.243	0.725	0.500	0.703	0.750	0.561	0.934	0.325	1.000	
15	0.207	-0.492	-0.167	-0.639	-0.002	-0.713	0.244	-0.679	0.524	-0.530	0.772	-0.276	0.940	0.034	1.000
16	-0.543	-0.198	0.302	-0.144	0.481	0.003	0.644	0.228	0.733	0.499	0.709	0.757	0.569	0.938	0.332
17	0.162	-0.310	-0.227	-0.492	-0.152	-0.636	0.017	-0.705	0.260	-0.672	0.526	-0.521	0.765	-0.269	0.935
18	-0.501	-0.184	0.142	-0.215	0.306	-0.155	0.499	0.002	0.662	0.240	0.742	0.519	0.712	0.772	0.567
19	0.525	-0.149	-0.194	-0.305	-0.299	-0.474	-0.141	-0.617	0.019	-0.675	0.247	-0.668	0.504	-0.523	0.749
20	-0.408	-0.112	0.042	-0.198	0.157	-0.217	0.331	-0.146	0.519	0.020	0.669	0.264	0.739	0.534	0.707
21	0.670	-0.035	-0.102	-0.132	-0.180	-0.280	-0.206	-0.452	-0.149	-0.607	-0.000	-0.695	0.223	-0.673	0.487
22	-0.262	-0.013	0.013	-0.115	0.061	-0.188	0.176	-0.201	0.340	-0.129	0.514	0.034	0.654	0.766	0.728
23	0.778	0.012	0.005	-0.015	-0.099	-0.113	-0.189	-0.269	-0.221	-0.455	-0.165	-0.620	-0.013	-0.705	0.220
24	-0.078	0.076	0.046	-0.073	0.029	-0.095	0.049	-0.168	0.171	-0.188	0.320	-0.127	0.487	0.023	0.637
25	0.833	-0.001	0.090	0.029	-0.003	-0.007	-0.116	-0.116	-0.207	-0.286	-0.232	-0.478	-0.166	-0.615	-0.003
26	0.115	0.127	0.114	0.093	0.054	0.016	0.026	-0.081	0.054	-0.165	0.148	-0.197	0.298	-0.144	0.477
27	0.850	-0.057	0.129	0.006	0.075	0.025	-0.020	-0.021	-0.128	-0.137	-0.207	-0.306	-0.222	-0.487	-0.150
28	0.234	0.131	0.183	0.145	0.111	0.105	0.041	0.018	0.037	-0.091	0.037	-0.194	0.140	-0.216	0.304
29	0.787	-0.125	0.113	-0.061	0.112	-0.078	0.065	0.007	-0.020	-0.037	-0.115	-0.145	-0.187	-0.299	-0.203
30	0.442	0.095	0.229	0.145	0.173	0.148	0.095	0.096	0.025	-0.000	0.000	-0.113	0.043	-0.199	0.159
31	0.554	-0.177	0.057	-0.139	0.101	-0.079	0.111	-0.074	0.076	-0.000	-0.000	-0.031	-0.093	-0.125	-0.172
32	0.552	0.034	0.233	0.099	0.213	0.135	0.159	0.130	0.038	0.077	0.031	-0.014	0.017	-0.116	0.067
33	0.513	-0.195	-0.013	-0.195	0.055	-0.153	0.112	-0.086	0.130	-0.018	0.094	0.017	0.013	-0.008	-0.092
34	0.577	-0.023	0.193	0.024	0.216	0.078	0.206	0.114	0.164	0.117	0.104	0.075	0.053	-0.004	0.038
35	0.360	-0.179	-0.072	-0.214	-0.003	-0.203	0.075	-0.149	0.133	-0.070	0.143	0.005	0.095	0.037	-0.000
36	0.557	-0.069	0.129	-0.047	0.184	0.003	0.219	0.083	0.220	0.111	0.182	0.126	0.121	0.093	0.063
37	0.218	-0.133	-0.101	-0.190	-0.054	-0.211	0.018	-0.189	0.091	-0.129	0.135	-0.050	0.131	0.015	0.074
38	0.503	-0.079	0.067	-0.090	0.133	-0.060	0.200	0.000	0.240	0.073	0.235	0.132	0.189	0.147	0.117
39	0.100	-0.072	-0.090	-0.129	-0.080	-0.173	-0.040	-0.189	0.021	-0.170	0.079	-0.119	0.113	-0.053	0.107
40	0.434	-0.058	0.024	-0.095	0.082	-0.093	0.156	-0.051	0.220	0.020	0.249	0.097	0.232	0.148	0.175
41	0.021	-0.018	-0.048	-0.056	-0.074	-0.105	-0.076	-0.151	-0.049	-0.177	0.000	-0.171	0.054	-0.132	0.094
	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
16	1.000														
17	0.029	1.000													
18	0.941	0.320	1.000												
19	-0.282	0.912	0.008	1.000											
20	0.774	0.558	0.919	0.304	1.000										
21	-0.533	0.746	-0.298	0.934	-0.001	1.000									
22	0.523	0.701	0.760	0.553	0.914	0.307	1.000								
23	-0.678	0.499	-0.537	0.761	-0.295	0.939	0.013	1.000							
24	0.244	0.723	0.499	0.702	0.748	0.560	0.933	0.324	1.000						

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DETERMINANT = 0.999163687229157E 00

MULTIPLE SQUARE CORRELATION= 0.7308

PERIOD/FREQ.	AMPLITUDE	T-VALUE
0.0470	1.8927	16.0190

DETERMINANT = 0.998968720436098E 00

MULTIPLE SQUARED CORRELATION= 0.7217
PERIOD/FREQ. AMPLITUDE T-VALUE
0.0460 1.8660 15.5327

DETERMINANT = 0.999933779239655F 00

MULTIPLE SQUARED CORRELATION= 0.7015
PERIOD/FREQ. AMPLITUDE T-VALUE
0.0480 1.8510 12.9776

xxx

COMPUTING SPECTRUM USING THE FOLLOWING BANDS IN MODEL
0.0470

DETERMINANT = 0.151127241551876E-01

MULTIPLE SQUARED CORRELATION= 0.8873

PERIOD/FREQ.	AMPLITUDE	T-VALUE
0.0460	5.0615	13.9587
0.0480	4.9467	25.1598

DETERMINANT = 0.677171349525452E-01

MULTIPLE SQUARED CORRELATION= 0.8900

PERIOD/FREQ.	AMPLITUDE	T-VALUE
0.0450	2.5702	24.9926
0.0480	4.9467	25.1598

DETERMINANT = 0.179735481739044E 00

MULTIPLE SQUARED CORRELATION= 0.8893

PERIOD/FREQ.	AMPLITUDE	T-VALUE
0.0440	1.7457	19.2663
0.0480	4.9467	25.1598

DETERMINANT = 0.153529718518257E-01

MULTIPLE SQUARED CORRELATION= 0.8882

PERIOD/FREQ.	AMPLITUDE	T-VALUE
0.0450	2.5702	24.9926
0.0470	1.8832	36.9735

DETERMINANT = 0.177635967731476E 00

MULTIPLE SQUARED CORRELATION= 0.8893

PERIOD/FREQ.	AMPLITUDE	T-VALUE
0.0450	2.5702	24.9926
0.0490	2.4549	22.6255

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COMPUTING SPECTRUM USING THE FOLLOWING BANDS IN MODEL

0.0450
0.0480

M U L T I P L E B A N D S P E C T R U M

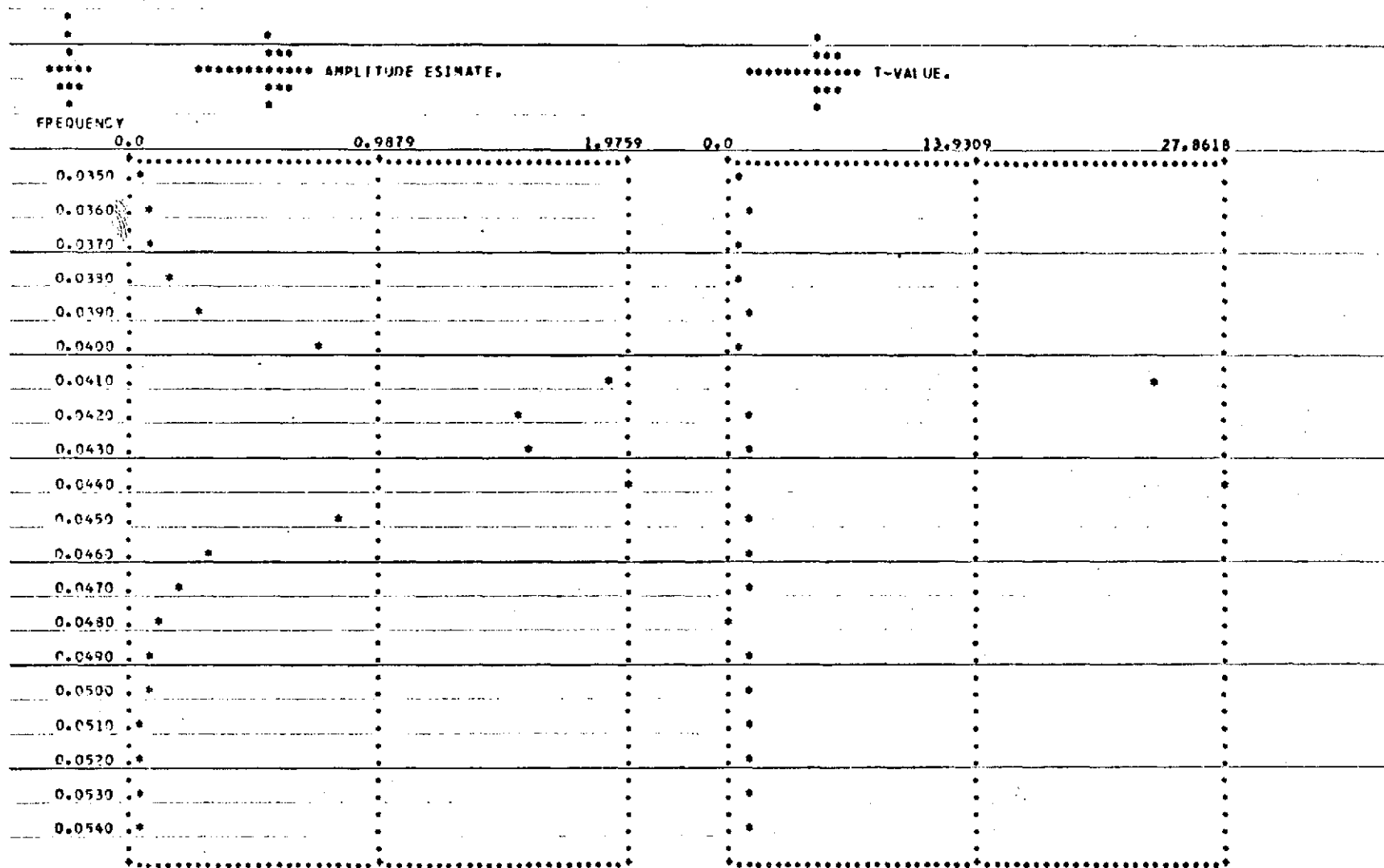
FREQUENCY	AMPLITUDE	T-VALUE	PHASE
0.035	0.062	1.095	-1.280
0.036	0.032	1.125	-1.501
0.037	0.115	0.899	1.400
0.038	0.176	0.710	1.148
0.039	0.312	1.214	0.887
0.040	0.773	1.063	0.619
0.041	1.931	23.878	-0.612
0.042	1.552	1.316	0.072
0.043	1.573	1.477	-0.199
0.044	1.976	27.862	0.535
0.045	0.932	1.149	-0.763
0.046	0.343	1.359	-1.047
0.047	0.204	1.175	-1.335
0.048	0.140	0.339	1.515
0.049	0.106	1.310	1.218
0.050	0.085	1.412	0.916
0.051	0.072	1.183	0.608
0.052	0.064	1.473	0.293
0.053	0.058	1.628	-0.030
0.054	0.054	1.402	-0.360

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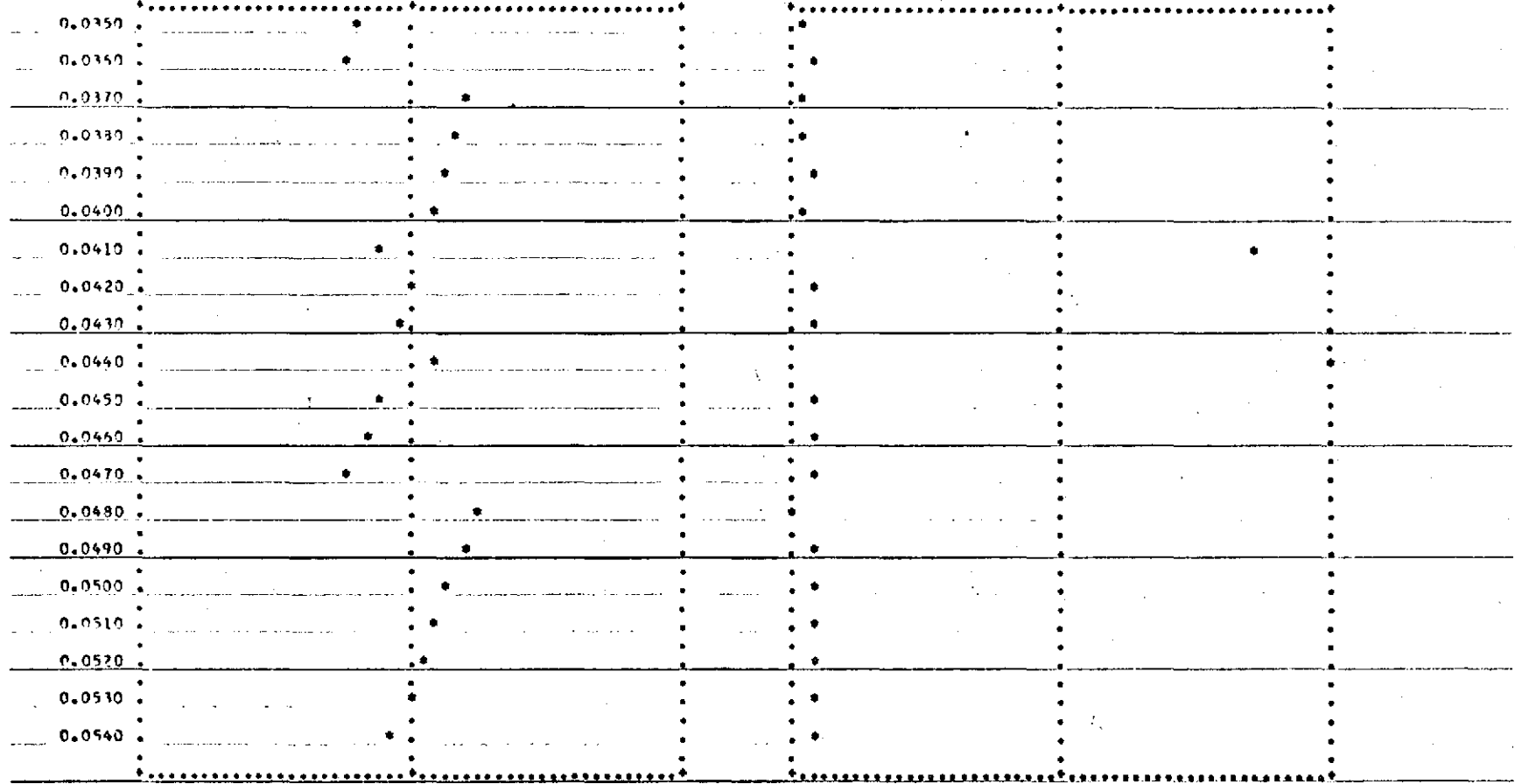




***** PHASE ESTIMATE.

***** T-VALUE.

FREQUENCY -6.2832 0.0 6.2832 0.0 13.9309 27.8618



XXXXXX

MULTIPLE SQUARED CORRELATION= 0.8903